RAILROAD GAZETTE

FRIDAY, MARCH 24, 1893.

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Contributions.

Deflection Angle or Tangential Angle.

University of Illinois,
CHAMPAIGN, Ill., March 19, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

So far as my observation has extended, the railroad field engineers almost universally use "deflection angle" as defined by Henck, Searles, Butts and Godwin. I have sometimes extended its use to the angle between the tangent at the transit point and the chord to another point—also called total deflection.

The use of the term tangent is already indefinite, for the word may mean the geometric or the trigonometric tangent, the tangent-distance or the straight line between curves. And may not tangential angle be taken as the angle between tangents, *i. e.*, the total intersection angle, as well as the angle between the tangent and the chord? I prefer to use deflection angle.

A. N. TALBOT, *Professor of Municipal Engineering*

Does the Drawing Room Car Pay?

NEW YORK, March 13, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A recent trip from New York City to Pittsfield, Mass., over the Harlem route, returning by the Housatonic, prompts me to seek through the columns of the *Railroad Gazette* some information regarding the "drawing room car" as an earner of revenue. In expressing my doubts as to its utility in this respect, a friend observed that if it did not pay to haul it the managers would soon find it out. My experience has taught me, however, that many of the large companies are like a snake, the distance from the head to the tail being such that details in operating are frequently out of sight, and that leaks and abuses may exist for years without attracting sufficient attention to bring about a change. It appears to be the accepted rule that the traveling public demands classification; that there are people who are willing to pay an extra dollar for the exclusive society of a colored porter and the privilege of occupying a pivoted chair. If there is an occasional individual of this kind, should his whims be encouraged to the extent of hauling a special car on every run for his accommodation when it is by no means certain that it is his intention to go abroad on that particular day? Winter traveling in this latitude is frequently lonely at its best. The student of human nature may derive some satisfaction from observing the individualities of his fellow-passengers in a day coach. So far as comfort is concerned the drawing room cars on many Eastern roads are certainly inferior to the day coaches in ordinary use in other sections of the country. That objectionable social element which it is desirable to segregate naturally drifts to the smoker, and with a little care on the part of the brakemen, there should be no reasonable excuse for the extra expense incurred in hauling a drawing room car hundreds of miles without a single fare for the accommodation of an occasional pessenger who desires to be exclusive.

Upon the return trip referred to, the case was still more aggravating, as a blizzard prevailed that day, so that every additional car increased the delay, and the maintenance of schedule time was out of the question. Finally, after hauling the drawing room car from Pittsfield to Danbury, about 80 miles, it was cut off, and the colored brother who had been its sole occupant was given an opportunity to recuperate from the exhausting efforts of his run, which had been productive of a single quarter, exacted for the use of a card table in the next car.

It has been asserted that in many cases cars of this class have been run for the sole purpose of swelling the mileage account, a practice which has not in all cases proved beneficial to the railroads most directly interested. In other cases, however, drawing room cars are owned and operated by the railroad company itself, and in such cases the questions may well be asked: Are they necessary? Do they pay? And if they are necessary, and do pay on our Northern lines in summer, is the same result true in winter?

OBSERVER.

Tidiness in Railroad Stations.

NEW YORK, March 9, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your correspondent G. C. H. has opened up a question of considerable importance; has laid down a code of rules, and pointed out plenty of things to be done, to promote tidiness in small stations. There is one fatal defect in his plan, however; I cannot see that he has provided a person to actually do the work. If the railroad company is to provide a man, or a corps of men, who are to polish stoves, scrub floors, etc., that is one thing; if the solitary individual who now serves as agent, operator, baggageman, switchman, etc., etc., etc., is expected to take up the profession of landscape gardening, etc., it is quite another. Judging from the amount of time consumed in keeping a dwelling house in "apple-pie" order, the theoretical round of duties laid down by your correspondent would require the undivided attention of *somebody*. The passenger who may be a model of tidiness at home becomes a hog in a public place. It is by no means a pleasant duty to follow up the trail and remove the leavings of such a creature. At stations of any importance a porter is regularly employed whose prime duty it is to properly care for the rooms in a station.

The railroad station at many important points provides the only closet available for public use. The drinking saloon also affords equal facilities and in some cases armchairs for its patrons. In hundreds of small towns, however, the saloon has been suppressed, and the country store may lack seating capacity, so that the railroad station becomes the only convenient resort for the town loafers as well as passengers. Such a constitueney will soon discourage the most ardent efforts to enforce rules of tidiness. Not the least of the difficulties encountered is the providing of proper receptacles and the final disposition of accumulated rubbish. One simple provision against the old paper nuisance is to place suitable waste baskets in the waiting rooms. The rubbish which naturally gravitates to them is more readily removed than if scattered about a floor, for I assume that even in the most flagrant cases of demoralized stations the rooms are occasionally swept. The peanut fiend is a terror to train hands as well as stationmen. His débris has a single merit—it will burn. If he could be induced to throw his shucks into some receptacle, the difficulty would be solved, but half the charm would be gone if the eater could not scatter the shells broadcast.

My solution of the problem would be a suitable number of traveling porters, who might be selected from section gangs or hired for the special purpose. Handy men who could paint, whitewash and repair would probably save in property what extra wages they might command. The very best men for such duties would be sailors, who are especially trained in keeping everything shipshape. The intervals of their visits should not be too long, and their efforts in promoting cleanliness would no doubt be made effective by the active co-operation of the very men who are now so neglectful because of their attention being divided among so many duties which are of vital importance to the proper operation of the road.

EX-HAYSEED.

The Locomotive "Governor Paine."

NORTHFIELD, Vt., March 9, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

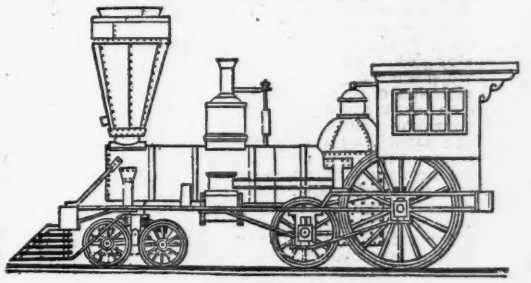
Referring to your sketch of engine "Governor Paine" in the *Railroad Gazette* of Dec. 23, 1892: I ran the engine the three last years of its use on regular trains on the Vermont Central Railroad, which was in 1856, 1857 and 1858. My run was between Northfield, Vt., and West Alburg, Vt., 91 miles; accommodation train north three cars, and mail train south four cars; running time, three hours and 13 minutes.

At that time A. R Morrill was Master Mechanic for that company (Vermont Central), and had made some changes on the engine, When the engine came on the road she had the regular Baldwin hooks; the axle was so close to the rear of the firebox that they worked from the cams backward, which made the "hook straps," or rods, very long, and the complicated rigging was always getting out of repair. Mr. Morrill took them out, put cams on the outside of the wheels, and put in place of the hooks link motion with a balanced valve, which was called the Gleason balanced valve. It was perfectly balanced and worked well, but was a complicated affair; took a fine machinist to put it in, and the engineer had to be very careful and heat it up before starting, or it would stick and strip the valve stem. He also took out the lever for shifting the weight from "pony" to drive wheels, it being impracticable.

Your cut of the engine is not a very good one.* The back dome was partially in the cab and extended quite a little above it. She took steam in the back dome, which was carried by a dry pipe to the forward dome and thence to cylinders through a pipe (wound with marlin) around outside of boiler.

The driving wheels, including tires, were 7 ft. 2 in. She was a good steamer, and one of the best of riding engines; was rather loggy on the start when I ran her; may have been quicker with the hook motion. She would run very fast; have no record of any *one mile*, but have made the run from West Alburg to Northfield (91 miles) with mail train (four cars) in 148 minutes, making 17 stops, one trestle bridge one mile long with draw (over which I was not allowed to make but 15 miles per hour), and seven other bridges, for each of which I was required to use one minute. Three of the stops were at junction points and were long. Taking out time for stops and bridges, the actual time used in running would be 60 miles an hour or more. You must take into consideration that this was before the era of air brakes and steel rails. She had a large copper whistle which could be heard a long distance, and the saying was that "farmers set their clocks by the 'Governor's' whistle," she coming so regular on time.

She was called unlucky, so much so that no one wanted to run her, even with the extra pay they gave for running her. Nearly every one that ran her previous to myself she marked in some way, her last victim being a Mr. Flint, later known as the proprietor of "Quaker Bitters." It took quite a little urging and some promises to get me to undertake it, but when I became familiar with her I never ran an engine I liked better in my 30



The Governor Paine—Built in 1848.

years of locomotive running, or any that ran with less expense to the company. I ran her one season, May to December, without one cent being charged to her for repairs. She was not run winters. Flint, the one that ran her the summer previous to the time I took her, was an old sailor, and used sea phrases. The remark he made to me when he saw me under the engine looking it over before starting out on my first trip (when I was as much in fear as ever in my life) will show what he thought of her. Looking under at me he said: "Young man, are you going to drift out on that thing? if you are there is a wooden leg growing for you." He had about the same thing as a wooden arm that he acquired by running her. At the time I ran her there were two other engines running opposite; one a Fairbanks Taunton (insider), one of the smartest class of engines on the start that was ever made. The other was made at the Northfield shops, but they could neither of them "get there" with the "Governor." "General Scott," an old time agent at Swanton, Vt., used to remark that he could tell to a second what time the mail train would arrive at Swanton when he heard the "Governor's" whistle at Alburg Springs, seven miles away.

The fourth season E. F. Perkins was Master Mechanic, and he had the engine put in shape, and asked me to run it without extra pay, which I declined to do, and the engine never was run on regular trains again, but was used a little on construction trains, and then broken up for scrap.

GEORGE C. RANDALL, *for 30 years an Engineer on Vermont Central & Central Vermont Railroad.*

* We reproduce the cut from the *Railroad Gazette* of Dec. 23.—EDITOR.

The Engineers' Strike and Boycott at Toledo.

The strike of the locomotive enginemen on the Toledo, Ann Arbor & North Michigan has become the talk of the whole country during the past week in consequence of the boycotting of freight from that road by enginemen on the Lake Shore & Michigan Southern, and the arrest of seven of these latter for contempt of court.

It appears that Mr. Arthur, representing the Ann Arbor strikers, agreed with President Ashley to call in Railroad Commissioner Kirkby of Ohio, as arbitrator of the strike; but he decided that the strikers should not be taken back except as vacancies occurred, and Arthur then claimed that Kirkby had misrepresented something and repudiated the decision. Meantime the threats of a boycott continued and finally some enginemen of the

Lake Shore & Michigan Southern, on being asked to move trains containing freight from the Ann Arbor road, quit work. One of them asserted that he was sick. These men were arrested and brought before Judge Ricks, who had issued the injunction forbidding them, in accordance with Section 10 of the Interstate Commerce law, to discriminate against the Ann Arbor road, and they were held in $200 bonds each for trial this week. In binding them over Judge Ricks said:

The order of the court was made in this case after due consideration, with full knowledge of its scope and possible consequences and with the firm purpose to enforce it in its letter and spirit without unnecessary hardship, but with such promptness and vigor as might become necessary to give full protection to all concerned.

You are now before the court under an order based upon affidavits to show cause why you should not be attached for contempt for refusing to obey the order of the court, a copy of which has been duly brought to your attention. The court proposes to give you full opportunity to employ counsel, take advice and make all proper defenses. You are to have your day in court, and be fully heard. But I desire now, at this stage of the proceedings, to suggest to you that you should not overlook the nature and importance of your employment. You are engaged in a service of a public character, and the public are interested, not only in the way in which you perform your duties while you continue in that service, but are quite as much interested in the time and circumstances under which you quit that employment. You cannot always choose your own time and place for terminating these relations. If you were permitted to do so you might quit your work at a time and place and under circumstances which would involve irreparable damage to your employers, and jeopardize the lives of the traveling public.

Your employers owe a high duty to the public which they are compelled to perform under severe penalties of the law, and they have in turn a higher claim upon you and your service than that due from the ordinary employé. This court does not assume the power to compel you to continue your service to your employers against your will, but it does undertake to compel you to perform your whole duty while such relations continue; and does further claim for the purposes of ascertaining whether its orders have been violated the right to determine when your relations to your employer legally terminated and when your obligations to observe this order ceased. So that it may in the meantime be important for you to reflect and consider whether you can safely proceed to continue in your employer's service with the purpose to quit it at a moment when some duty may be required of you which is in violation of some supposed promise or obligation you owe another, not your employer. The time for leaving your post of duty might come under circumstances when you would, by such act, unintentionally, imperil the safety of the lives intrusted to your employers, and do his business vast and irreparable damage. It might, too, unintentionally, involve you in a conflict with the court through obstructing its process and interfering with its mandates.

I therefore suggest to you and to all others who are in similar employment that there ought not to be any strained construction made of the provisions of the court's order. The only safe way to obviate trouble is to quit the service of your employer, if you do not intend to observe the orders of the court as made, and which are binding upon you while that service continues. This you have a right to do. But if you continue in that employment this court will expect you to do your full duty to your employer and to the public, and to observe the orders which have been made in this case.

The high character which the public justly give to the engineers and firemen who serve on our great railways has been earned by innumerable proofs of the most loyal service to employers and the most heroic and faithful devotion to duties of great peril. The court has the right, therefore, to expect from such men a willing observance of the laws of the land and due respect for such orders and processes as it may be called upon to make in this case, in the fulfillment of its duties to the public and the parties invoking its jurisdiction.

It will be seen that Judge Ricks did not, as has been reported, make a sweeping denial of the right to quit work without notice, nor was this address a decision.

On the 17th Judge Teft, of the United States Court, issued an injunction at Detroit against Chief Arthur of the engineers and Chief Sargent of the firemen requiring them to raise the boycott against Ann Arbor freight. It restrains them "from issuing, promulgating or continuing in force any rule or order of any kind" under the rules and regulations of either Order "which shall require any employé to refuse to receive cars of freight in course of transportation from one state to another," from and to Ann Arbor. It also prohibits them from endeavoring to persuade or induce any employé to boycott, etc.; aud in case any such orders have been issued by either Arthur or Sargent, prior to the service of the restraining order, "they and each of them are hereby required and commanded to recall and rescind it." This order is returnable March 27.

The Ann Arbor road also entered civil suits against Arthur and Sargent.

After the arrests and injunctions the enginemen who remained at work (all but the seven arrested) did their work without complaint, all the roads receiving cars from the Ann Arbor.

Misfit Ties.

Some time ago a party of railroad directors and officials were passing over a newly completed railroad line on a tour of inspection. Turning to the Chief Engineer, one of the directors inquired of him the width of the embankments. The Chief Engineer replied that they were 12 ft., which was the standard prescribed by the specifications. This information seemed satisfactory and nothing more was said for a while. Again the director interrogated the Chief Engineer, this time as to the length of the cross ties. He was promptly answered that they were 8 ft. long, which was also in strict accordance with the specifications. The director mused, and finally blurted out, "Well, if your crossties are 8 ft. long and your embankments are 12 ft. wide, will you please explain how the deuce the ties project over the embankment at each end?"

Method of Erecting the Iritty Bridge, Malabar.

The accompanying cut shows the novel method employed in erecting the Iritty Bridge, 400 miles from the Malabar coast, in India. The work was designed and executed by Mr. George Anderson, member of the Institution of Civil Engineers, England, and until recently Resident Engineer of the Madras Railway, to whom we are indebted for the facts. To appreciate the advantages of this process one must know some of the causes which make bridge erection difficult in the region where this work was done.

Just above the site of Iritty Bridge the two streams which drain the long, spoon-shaped valley converge in one. These streams fall from 16 to 18 ft. a mile for about 10 miles above the bridge, and beyond that for five or six miles they fall faster from the plateau, some of their feeders having an elevation of 5,000 ft. above sea level, while the elevation of low water at the bridge is only 300 ft. above sea level. The valley drained by these streams is 35 miles long and varies greatly in width, the average being about 12 miles. At the bridge the hills close in, making the watershed only a mile wide, its outer borders being 300 or 400 ft. above the level of low water. Such conditions favor floods of great intensity and, during a monsoon, when two and more inches of rain per hour have been known to fall, the water at Iritty Bridge rises 20 or 25 ft. in one night. The monsoon is expected on the 15th of May every year, and from that time until the middle of November low water mark is never seen. Depending on the severity of the season, the depth of the water at this bridge ranges from 10 to 50 ft., so that bridge erection during these six months is a practical impossibility. It is important, therefore, to push the work once it is begun; and there is the added fact that the valley is very unhealthy. Mr. Anderson's staff, as well as the coolies, all suffered from what is known as the "Iritty fever," and the expense account was swelled by having about one-fourth of the force sick most of the time, though on the pay roll. Besides, these coolies were totally unskilled laborers and had to be brought from different places, none less than 25 miles away; and then it was with great difficulty that they could be persuaded to remain and work more than two or three days, because of the fever, and when they did work they could do but half or three-quarters of a fair day's work.

A thorough realization of these facts at the outset led the engineer to study up some method of reducing the actual manual labor to a minimum. A combination wood and iron cantilever and frame was hoisted in parts and put together on the pier. The work of hoisting and erecting the cantilever and lifting the tackle on each pier required one carpenter and six coolies working five hours. The same amount of work was required to dismantle and remove to the next pier. The trusses, weighing nearly seven tons each, were lifted by means of two 10-ton screw jacks resting on the ends of the cantilevers and carrying the lifting chain attached to the triangle at the end of each truss, as shown in the cut. The lifting chain was made in sections, pin connected, and provided at given intervals with holes through which a loose pin was slipped to hold the trusses in position when the jack screws had run their full length and had to be reset. As soon as a full section of the chain appeared above the bearing at the cantilever's ends it was removed. The cantilevers and frames were held steady by light guy lines, no anchors being necessary, as both the trusses of one span were raised simultaneously. When raised clear of the piers the trusses were drawn together by a screw traverse arrangement (which does not appear in the cut) and dropped into position. The scaffolding (seen at the left of one of the piers) was made of bamboo, the comparative cost of timber in that locality being great.

Sixteen coolies, four to each pair of jacks, were employed in lifting the trusses, and the time taken to raise two trusses to the full height of 55 ft. was eight hours. The quickest lift for a short run was nearly nine feet per hour. To gain time four sets of cantilevers and frames were used.

The total cost of erecting the ironwork by this method, including cost of trestle frames, cantilevers (the wrought iron floor beams of the bridge being adapted for these), lifting chains, all labor in fitting and erecting and finally dismantling the lifting plant and removing to the next pier, was 35 rupees per ton (about $12.25 at present rates of exchange). In comparison with this, the ordinary cost of erecting bridges on piers 20 to 25 ft. high, in such localities, by the falsework system has been from 40 to 50 rupees ($14 to $17.50) per ton, when coolies could be hired for eight annas (17½ cents) per day. It is estimated that with the price paid for coolies at Iritty, 12 annas (26¼ cents) per day, to erect this bridge by the falsework system to the required height, 55 ft., would have cost 80 or 90 rupees (say $30) per ton, including an equivalent allowance for sickness. The total weight of iron in one span was 20 tons, so that the cost of erecting one span by the old method would have been about $600; by the new method the erection actually cost $245 per span.

Method of Erecting the Iritty Bridge—Malabar.

Designed and Executed by Mr. GEORGE ANDERSON, *M. Inst. C. E., Resident Engineer.*

Compressed Air in Railroad Shops.*

I look for a rapid development of the use of compressed air in this country, and am confident that it will quickly grow in favor wherever introduced. Chicago, with her accustomed energy in such matters, has granted concessions to a company which proposes to establish mammoth air compressing plants at suitable points in the outskirts of the city and furnish air for pneumatic apparatus of all kinds. But Chicago has had trouble with her ordinances and is now looking at this one with suspicion.

But I am digressing from the subject of this paper, "The Use of Compressed Air in Railroad Shops," and "on railroads," we should have said; for pneumatic brakes, signals, gates and other apparatus are indispensable to the proper running of trains. The time is at hand when an air compressor will be as necessary to a well conducted shop as the steam engine, and most of the drudgery in and about such an establishment will be performed by this agency. The rapid development of the use of compressed air in railroad shops is astonishing. I presume there is scarcely a shop in this country that does not use it in some form or another, and this speedy evolution is no doubt largely due to the technical press publishing each new growth, which in turn leads to new applications. We find illustrations of an apparatus produced in Kansas for cutting off stay bolts, which does more work in one hour than could be performed by hand in 20 hours. From Nebraska comes a description of a pneumatic crane, a grate-shaking device and an apparatus for opening the furnace door. Then there are numerous air motors, large and small. The portable motor can be attached almost direct to boring bar or flexible shaft, dispensing with complicated countering-shafting, belting and rope toggles, while the smaller type is used as a breast drill when desirable or slung up in any convenient manner to reach a desired position. There are devices for sanding the rails for locomotives, delivering sand in desired quantities

*Extracts from a paper read by William McIntosh before Northwest Railroad Club, March 14.

directly where wanted, thus saving many a crank pin and strap from destruction and assisting many a train over a hill that would otherwise stall for want of sand or by reason of a too liberal supply, as often occurs when regulating its delivery by the lever and valves in common use. There are air bell-ringer motors, snow flangers and dumping and drop-buttom cars handled by pneumatic cylinders. Drop-pit cylinders are supplied with compressed air, and the heaviest pair of driving wheels or an engine truck can be balanced on the piston as buoyantly as a cork will float on water. There are air lifts for handling steel rails as easily as fence boards and innumerable hoists in and about shops, some suspended from cranes, some fixed in a stationary position and others sunk below floors for lifting driving wheels and other heavy weights.

Outside of shops this power is utilized for raising cars and trucks in repair yards and for elevating sand and coal and various other purposes. The latest application coming under my notice was for tripping and returning the ram of a hydraulic press, giving the operator absolute control of the ram even to $\frac{1}{64}$ of an inch. I might go on specifying indefinitely where this power is already employed and where it can be introduced to advantage. There is practically no limit to its usefulness, which is principally due to the ease and directness with which it can be conveyed to any locality and the entire absence of complicated machines.

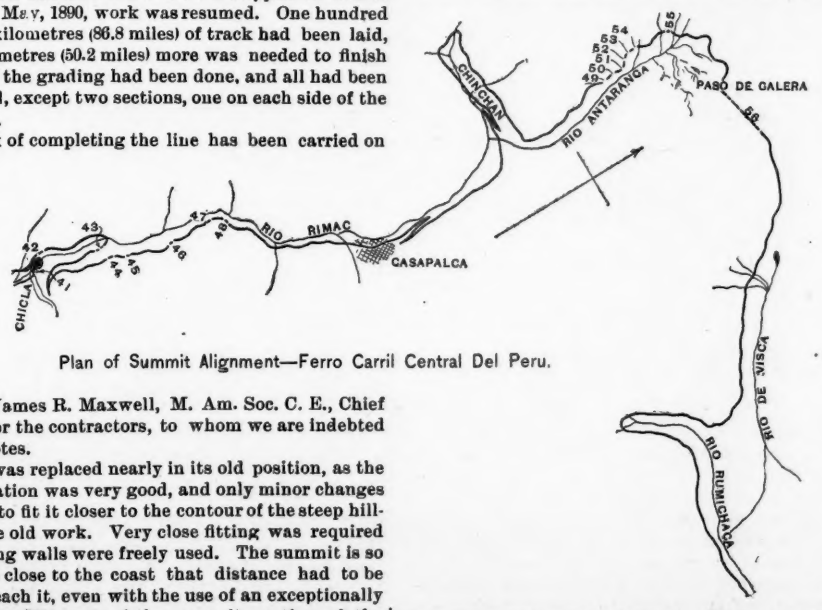
The Wuerpel Switch & Signal Company has a shop in St. Louis which is especially deserving of attention This plant is operated exclusively by compressed air, and the outfit embraces the general line of tools found in an ordinary machine shop. It is estimated that this shop is operated at a considerably less cost than it could be by the usual methods of shafting and belting. It is apparent that in driving tools by air the greatest benefit is to be obtained with machines that are not worked continually, such as boiler and blacksmith shop tools, and tools that are located in buildings remote from the engine room. When we convey power to these places by shafting or wire-rope transmission, it must be kept in constant operation with considerable expense of installation and maintenance; while in conveying steam any considerable distance there is a large loss by condensation. With compressed air there is no loss whatever and the cost of motors would be largely counterbalanced by saving in installation, and it is not improbable that the cost of fitting up an ordinary shop with line and counter shafting, belting, etc., would offset the expense of equipping such an establishment with direct-acting air motors.

The Ferro-Carril Central Del Peru.

This railroad has become almost historical from the facts that it reaches the highest altitude of any railroad in the world, that in its early stages some famous men were connected with it, and that it has on its line the Verrugas, which at the time of its construction was the highest viaduct in the world. It starts at Callao and crosses the Andes, terminating at Oroya. It is standard gauge (4 ft. 8½ in.); maximum grades are four per cent. on tangents, reduced to three per cent. on curves of minimum radius 120 metres (3,936 ft.). No compensation was made on curves of 600 metres (1,968 ft.) radius or more, and between these limits it was made proportionally. The minimum length of tangents allowed between curves turning in opposite directions is 30 metres (98.2ft.).

The road was begun early in 1870 and the track was laid to Chicla, a small town on the western side of the Andes in 1874 and all work was then stopped for lack of funds. In May, 1890, work was resumed. One hundred and forty kilometres (86.8 miles) of track had been laid, and 81 kilometres (50.2 miles) more was needed to finish it. Most of the grading had been done, and all had been commenced, except two sections, one on each side of the mountains.

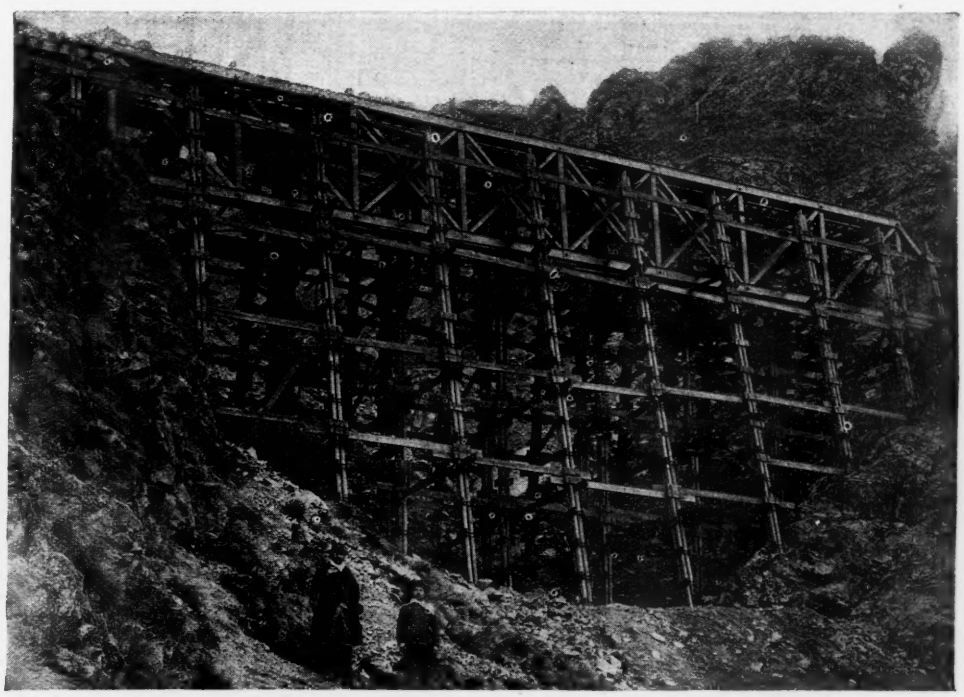
The work of completing the line has been carried on under Mr. James R. Maxwell, M. Am. Soc. C. E., Chief Engineer for the contractors, to whom we are indebted for these notes.



Plan of Summit Alignment—Ferro Carril Central Del Peru.

The line was replaced nearly in its old position, as the general location was very good, and only minor changes were made to fit it closer to the contour of the steep hillside and the old work. Very close fitting was required and retaining walls were freely used. The summit is so high and so close to the coast that distance had to be gained to reach it, even with the use of an exceptionally heavy grade. The map of the summit portion of the road shows how this was done. Advantage was taken of every place where development could be put in, and where it could not be switchbacks were used. A very good instance of this is at Chicla, where a line drawn across the valley would cross the railroad five times. This development gains 700 ft. of elevation, and the line does not get into the bottom of the valley again for five miles. At Casapalca it runs into the ground again, and two switchbacks and a plain development are used, gaining thereby over 1,100 ft. in elevation. With this help the grade carries the line over the summit at an altitude of 15,565 ft., and the location down the other side is easy, except at Rumichaca, where another switchback is required.

The rugged character of the route is shown by the number of the tunnels, of which there are 56 on the road. Sixteen of them are above Chicla, and were unfinished when the work was resumed. In all but one the headings had met, and in some of them the full section above the springing line of the arch had been excavated in parts and the arch built. When the work was stopped all the tunnels had been well timbered, but all this lumber had been stolen before work was resumed. This, and the use of excessive charges of explosives, made some very bad roofs and much fallen material, and caused considerable trouble and expense when the work was resumed. The most serious was in the Galera (Summit) tunnel. It broke down the arch in the same place where a slip had occurred before the arch was built. The fallen material had to be removed with great care and timber used very freely to support the loose mass above. Some of these rocks had to be blasted, but this was the last resort, only adopted when all other means had failed. When the break had been cleaned out down to the springing line of the arch a section of centering was put in, and strongly supported. Then the props were taken out, a few at a time to allow enough lagging to be put on to support one course of arch stone on each side. These were put in quickly, and material well rammed in above them before any more props were taken out. There was so much timber in the way that it was difficult to get the other materials in place, so that this masonry was very expensive. Several months' work was required to repair this break. The tunnel in which the headings had not met was filled up at the upper end in a curious manner. t did not require lining, and the full section had been kept up close to the heading. A small stream crossed the line above the approach. The Indians had put a few stepping stones in it, and they soon formed a dam, turning the stream into the cut, and carrying all the débris brought down in the rainy season into the tunnel.



Trestle on the Ferro Carril Central Del Peru.

The permanent structure is shown, in place.

The bridges were made in England, and the erection of them required a great deal of riveting to be done. As it was difficult to get skilled labor, and also for men from the coast to work at that altitude (over 15,000 ft. above sea level), this was a tedious job. To facilitate matters it was necessary to make the falsework strong enough to carry the material trains, and to have this done before the rails got there, so that the tracklaying should be delayed as little as possible.

The trestle shown in the engraving was designed so that all the pieces except the track-stringers were carried by mules from the end of the track to the site of the bridge. The posts were built up of four 6 in. × 6 in. pieces, those for the batter being 18 ft. long, and for the plumb posts 17 ft. 5 ins. The batter post pieces were painted on the ends, and no holes bored in any of them to avoid weakening them, and also to save trouble when they were carried to the next bridge, any batter piece fitting in any batter post, without cutting or new holes to bore. These were packed with pieces three inches thick; the bracing also served for packing at each story. The lower bridge on the Yanli did not cause any trouble or expense, as it is a natural bridge, made by the deposits from hot springs.

The first rainy season after the work had been done caused many landslips; most of them in cuts, where there was great irregularity in the fractures of the rocks. The worst slip was where the ground for about 400 ft. in length moved out and carried a fill with it. This was on a side hill about 1,000 ft. above the bottom of the valley, and on a bench having a light slope. The whole mass for 300 ft. below the line moved. The line was thrown in twice, and after the second time test pits were sunk to determine the character of the material below the road. As this seemed good for a depth of over 60 ft. below the original surface, and the bank to be built would not be higher than this surface it was thought to be safe. The summit on this road is 15,565 ft. above sea level. The maximum grade ends about six miles below the Rumichaca switchback. Most of that part was very heavy work, but below there the line is in the bottom of the valley, with (for that country) long tangents, light grades and light work.

Railroad Exhibits at the World's Fair.

The railroad exhibits will undoubtedly prove an interesting part of the World's Fair. The New York Central will exhibit an engine specially built for the exhibit and similar to those now running the Empire State Express. The engine will, however, be slightly heavier, the firebox being lengthened and the diameter of the drivers increased to 7 ft. 3 in. The brick arch used in the engines now running will be replaced by a Buchanan water arch. The historic exhibit of that company will comprise the old "De Witt Clinton" and two of the original coaches on the first American passenger train which ran on the old Mohawk & Hudson (now part of the New York Central) in 1831. The cylinders of this old engine* were 5½ in. diameter and 16 in. stroke, while the weight was about four tons. The engine was inside-connected and the inclined cylinders were attached

* This engine was illustrated in the *Railroad Gazette* of May 25, 1883.

to the upper part of the firebox and worked the cranked driving axle placed under the front of the engine. All four wheels were about 60 in. dia., and the rear wheels were probably coupled to the drivers.* The boiler had about 30 flues of copper ¼ in. thick, 5 ft. long and about 4 in. external dia. These dimensions are a remarkable contrast to those of the modern locomotive.

The Pennsylvania will send the "John Bull," the oldest engine on the road, which first started running on the Camden & Amboy, now part of the Pennsylvania. The "John Bull" was erected at Bordentown, N. J., by Mr. Isaac Dripps in 1831, all the parts of the engine having been made by Stephenson & Co., Newcastle-on-Tyne, England. Two early passenger cars will accompany this engine, and a large collection of the latest modern appliances will also be exhibited.

The Baltimore & Ohio will also make a fine historical exhibit of locomotives and permanent way which has recently been described in the *Railroad Gazette*.

Several foreign railroads will contribute fine exhibits. One modern and three old English locomotives will be exhibited, while France will contribute a train and Germany will show several freight cars. The London & Northwestern (Eng.) exhibit will be unusually complete and will embrace the "Queen-Empress," the latest and largest of Mr. F. W. Webb's express compounds, and a full size reproduction of the "Rocket," as she appeared at the famous Rainhill trials in 1829, fresh from Stephenson's factory at Newcastle-on-Tyne, and fitted with the first blast pipe, multitubular boiler and rectangular stayed firebox ever used. In addition, the first locomotive that ever ran on rails will be exhibited. This engine was built by the famous Trevithick, the first advocate of high pressure steam as opposed to James Watt, who considered its use impracticable with the imperfect mechanical appliances of those days, and therefore limited his pressure to a few pounds above the atmosphere. This engine was built at Pen-y-darran, in South Wales, and was first run on a tramway between Merthyr and Cardiff on Feb. 21, 1804. The cylinder, 4¾ in. dia., was connected to a big fly wheel, which was geared by cog wheels to the four driving wheels, which were smooth and not cogged. The driving wheels were coupled by gear wheels, though coupling rods were patented by William Sellers in 1801, three years previously. The boiler was cylindrical, of wrought iron, with flat ends, and was worked at 40 lbs. pressure, which was considered dangarously high in those days. The boiler had an internal cylindrical firebox and a return flue. The exhaust steam was turned into the stack, but was not used to urge the fire, for Trevithick for years afterward refused to believe that it could exert any useful influence on the fire, and showed this by afterward patenting a fan to create a draft.

This engine, on its trial, drew 10 gross tons weight of bar iron loaded on four-wheeled cars, running nine miles at the rate of 5½ miles per hour.

This is claimed to be the first freight train ever hauled by a locomotive on a smooth rail. The engine, however, proved too severe on the cast iron "plates" or "trams" used as rails, and after running for some time was taken off and used as a stationary engine. A fitter who worked on her was still alive in 1858, but it was not until many years later that Mr. Webb accidentally came across the remains of the old engine at a small country millwright's shop at Hereford. The parts were carefully collected and put together, and found to be nearly complete, and the missing parts were then made from old drawings, and form now a most interesting memento of the birth of the locomotive.

The London & Northwestern will occupy a track 280 ft. long, and in addition to the three important links in the history of the locomotive, in A. D. 1804, 1829 and 1893, will exhibit some old track laid on stone blocks which were in use until comparatively recent years.

Two modern passenger cars will also be shown. One is a sleeping car and the other a composite day coach, having accommodation for first, second and third class passengers, with lavatories. The American truck has been adopted at last, and these cars are mounted on four-wheeled swing-bolster trucks. In place, however, of equalizing bars and spiral springs, an independent semi-elliptic spring bears directly on each journal box.

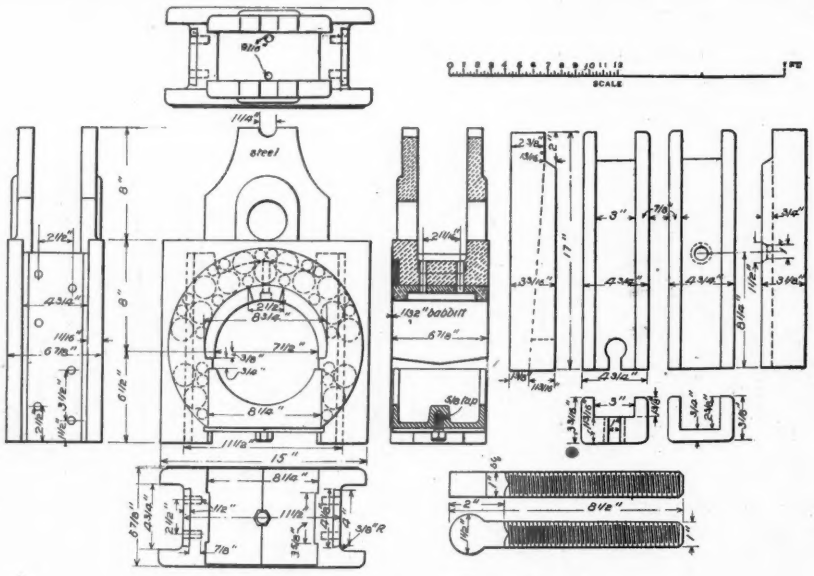
A full sized set of signals with levers and interlocking gear will be shown. The Webb & Thompson electric train staff apparatus, which is a block system applied to a single track, and insures one train only being on a section at one time, will also be shown. This system* is being used on many long stretches of single track and avoids the necessity of stopping for train orders. Through trains merely slack down to 25 or 30 miles to pick up the staff at the staff stations, the fixed station signals, home and distant, being lowered to indicate that the staff is ready. If the staff is not at that station the danger signal is shown, and the rules oblige the engineer to never proceed without having the staff in his possession. If A, B and C are staff stations, an engineer in running from A to C will, on starting from A, receive a staff, which authorizes him to proceed to B. On slacking at B he will perceive the signals lowered and the operator waiting on the platform ready to hand him the staff from B to C. The staffs are quickly exchanged without stopping, and it is possible in this manner to run heavy express trains at 40 miles per hour, including all slacks, over a single track, with numerous grades of 88 ft. per mile.

It may be explained that when the staff from A to B is taken out of its box at A, it is impossible to issue another staff from A until the staff has been placed at the box at B. And further, the operator at B cannot draw out a staff giving right of way for a train from B to A when once the operator at A has issued a staff from his box at A. The boxes are worked in pairs, and the two boxes at A and B, giving the right of way between those two points, hold, say, 20 staffs. Directly one staff is taken from either box, the rest are locked fast and cannot be removed. It is thus impossible to get more than one train on a section at a time. But directly the staff is restored to B, another staff can be issued from either A or B, but not from both. It is thus possible to have a dozen trains following one another in the same direction, but in each case a clear interval of a whole section is maintained between them. While the ordinary staff and ticket system prevents a butting collision, it is no safeguard against a rear collision, but this electric interlocking of the staff boxes is an absolute safeguard against either butting or rear collisions.

Another English road, the Great Western, also contributes an interesting link in the history of the locomotive. The "Lord of the Isles" is one of a class of express engines first built as far back as 1846, but which with repairs and new boilers still ran some of the heaviest and fastest express trains in Great Britain up to 1892. The "Lord of the Isles" was built for Brunel's broad gauge of 7 ft. in order to demonstrate that it allowed room for far larger and more powerful engines than the narrow gauge. As the heating surface was nearly 2,000 sq. ft., and the grate area about 23 sq. ft., it is not surprising that these engines soon attained very high speeds with the light coaches then in use, and even as late as 1863 the schedule time was 57 minutes for a run of 53½ miles, a speed of 56.3 miles per hour, which is now only surpassed by the Empire State Express. The best run ever made by these engines was the same distance in 46½ minutes, or 69 miles per hour. The train, however, was very light, weighing only 50 tons, or less than the weight of engine and tender. These engines are interesting as being the first express engines ever built and being designed with so much forethought that they did good work for some 45 years, notwithstanding the great increase in the weight of trains. The cylinders are 18 by 24 and the single pair of driving wheels 8 ft. dia., but the broad gauge permitted the boiler centre to be kept down to 7 ft. from the rails.

The Great Western will also exhibit specimens of their old track, in which a light bridge rail 62 lbs. per yard was laid on longitudinal sleepers, the continuous support enabling the rail to carry weights on individual wheels fully equal to those now used. As, however, the price of rails fell and that of timber rose, this method of construction ceased to be economical and was superseded by the 86-lb. bull head steel rail on ordinary cross ties, of which a specimen is also exhibited.

The North British will exhibit a fine model of the Forth Bridge and numerous lines will show large photographs of their engines, rolling stock and principal structures, stations, signal boxes, bridges, etc.



Steel Driving Axle Box—Boston & Albany Railroad.

Steel Driving Axle Box, Boston & Albany Railroad.

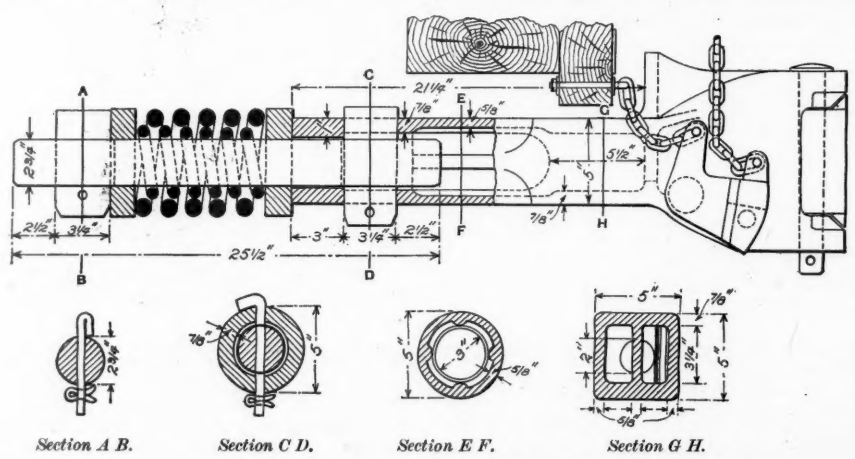
The accompanying engraving represents the steel driving axle box which has been used since 1882 with great success on the Boston & Albany and was referred to at the February meeting of the New York Railroad Club. All engines built at the railroad shops have these steel boxes.

The brass is formed in three parts, the two side pieces being put in first and the middle or crown being then driven in, keying all in place. The hub wear is taken up by babbitt, secured as shown. It is found that this arrangement entirely prevents hub wear, which is very considerable when the steel is allowed to wear direct against the driving hubs. The steel boxes also give little trouble from breakage.

A Suggested Improvement in Tail Bolts for M. C. B. Couplers.

The accompanying illustration shows an improvement in tail bolt arrangement suggested by Mr. S. T. Smith, Manager of the Empire Car Coupler Company. It will be seen that the proposed improvement consists in using a tail bolt with two keys, one key taking the place of the bolt head as generally used, and so allowing the entire shank of the coupler to be strengthened without increasing the outside diameter. This arrangement allows the use of a larger tail bolt, so that the bolt remains sufficiently strong at the key way, which is the point where it generally breaks when the bolt is well forged. When not well forged, it usually breaks off under the head. The points in favor of tail bolts of this design are that the key through the coupler shank can easily be made stronger than the bolt with a head; the tail bolt cannot turn and allow the key to drop out if the key has not been properly put in; the first cost and cost for repairs are less. With the keyed tail bolt the piece work price of removing a drawbar is just one-half the price of removing one with a yoke.

Altogether, this proposed improvement is worth attention from those who still incline to the continued use of tail bolts.



The Empire Coupler, Showing Suggested Changes in Tail Bolt.

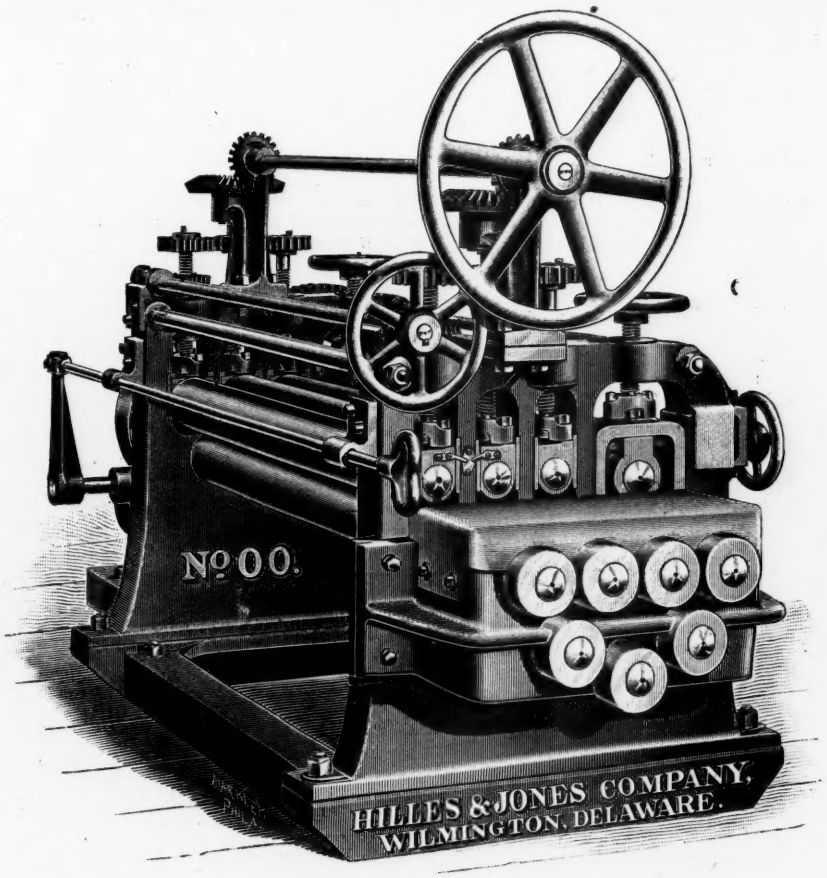
* Old drawings of the engine differ considerably, some showing a dome and no coupling rods, and others coupling rods but no dome. It is difficult to believe that either was evolved from the imagination.

*This system was described and illustrated in the *Railroad Gazette* of Aug. 1, 1890.

Hilles & Jones Plate Straightening Rolls.

The accompanying illustration shows the end view of the patent plate straightening rolls, made by Hilles & Jones, of Wilmington, Del. This machine consists of eight rolls arranged in a special position covered by a patent. Three of the top rolls are raised simultaneously by means of a large hand wheel, the outside roll of this set being also vertically adjusted by means of the smaller hand wheel. The fourth top roll is independent of the other three and has vertical and horizontal adjustment. It is placed directly over one of the bottom rolls so that a positive pinch or compression can be made on the plate passing through in conjunction with the corrugating process by the other rolls. This is of material aid in strengthening plates, especially those which need stretching on the edges or in the middle to remove buckles. This machine is made in various sizes depending on the work to be done and is driven by duplex friction clutch pulleys.

The illustration shows the No. 00 size, which is adapted to deal with plates and sheets from No. 16 wire gauge to ¼ in. thick, but machines on precisely similar principles are made to deal with plates up to 1⅛-in. thickness.



Patent Plate Straightening Rolls.

Made by the HILLES & JONES CO., *Wilmington, Del.*

Qualifications and Responsibilities of a Genera Passenger Agent.*

I will take for my text the statement made by a well-known general manager that "it is the duty of the traffic department to secure business; the operating department to take care of it after it is secured." Were that theory universally accepted, this paper would not have been written. Mr. Heafford then went on to discuss the organization of the personnel of railroads, and among other things spoke of the difficulty of adjusting salaries satisfactorily. In closing this part of his address he said:

The employé usually wants more money than he gets, on the principle that he should "make hay while the sun shines." He is apt to live for the present, trusting to Providence and his own anticipated good luck to help him out in the future. He is not sure as to what will be his deserts when the time comes when he must give way to younger men, and with no assurance that he will be provided for in his old age, feels now that he must reach for everything in sight. If all this were changed, and faithful, meritorious employés were made to know that duration of service would entitle them to be placed upon a graduated pension list on arrival at a certain age, more and better work for less pay would be secured, and the money saved on the pay-roll during actual service would, in my opinion, more than compensate for the annual outlay required to meet the "retired list" expenditure, and a loyalty and discipline would be attained that could not be had by any other means. Coming to the main topic of his address the speaker said:

I think I am correct in assuming that the general passenger agent is the best person to say what is required by the public in the matter of train service. By this I mean equipment and time schedules. He is the person to whom come all manner of suggestions, demands and complaints regarding passenger affairs. He, and his representatives, circulate among the people and feel the public pulse in a thousand ways. He is jocularly called the head of the "ornamental branch of the service," and is generally supposed to contribute much to the revenue of the company by his personal popularity. It is no doubt true that a man who stands well with his fellow-men is better than he who is habitually cross-grained and ugly on all occasions, but there is something more required of the general passenger agent of the present period than being "a hail fellow well met." He must first know more than the rudiments of his business. He must have acquired some knowledge of the cost of securing and handling traffic. He must endeavor to secure a fair profit upon the capital invested. He must be fully in accord with the policy of the management and must be frank and loyal to his superiors in office, and considerate and fair in his dealings with his subordinates. He must be a diplomat with his competitors and must endeavor to maintain the most friendly official relations with his connections. His brightest side must always be turned toward the critical passenger who loads and unloads himself, and whose praise or complaint of service rendered makes or mars the reputation of any through car line. . . . On many roads it is the custom of the officers in charge of the operating department to put on passenger trains or take them off without consulting anyone in the traffic department. The order is given, and then is the passenger department notified, and, it often happens that in so doing many well developed plans for securing revenue are upset in a day. To my mind that is wholly wrong. The business of the traffic department is to secure traffic; that of the operating department to care for it. It should be wholly within the province of the passenger department to have the final say on the question of train service being established or discontinued. The general passenger agent knows, or ought to know, the earnings of every train carrying passengers. He knows, or ought to know, the needs of communities all along the line. He knows, or ought to know, what causes a decrease or increase in the traffic by weeks and by months, and can determine if there is a fair profit or not in the business. He should consider the mail and express service or other miscellaneous service which produces a revenue for all regular passenger trains, and should confer with the general manager if the results fail to show a satisfactory profit after a fair trial, with a view to having certain trains discontinued, or the experiment prolonged if circumstances or good public policy would seem to require it.

His recommendation for additional trains, more coaches, new sleeping cars and improved equipment of all kinds are usually based upon the facilities offered by competing lines, or upon his knowledge of the needs or desires of the public. It cannot always be figured out in advance just what a new train will earn per mile for a few months of experimental trial, but it is often a money-making investment in the end to be able to practically demonstrate to numerous clamorous patrons that additional trains cannot be run except at a loss. It has happened that many soreheaded and complaining customers have been appeased by an apparent cheerful yielding to their wishes for a brief period, and the actual income and expense of additional train service shown to their discomfiture. It costs some money in such cases, but it costs less in the end because complaints cease. No person expects the railroad to do business at a loss.

There is an extensive field in connection with the operation of special passenger train service for local excursion business in which the traffic department should be given wide latitude. . . . Opinions differ as to the general conditions under which local excursion business can best be stimulated and handled. Probably the special local excursion business within short distances that can be handled every day going and returning on regular trains, while perhaps large in the aggregate on some lines, is small compared with similar business that can be secured by judicious special train service. While opinions may differ as to the desirability of furnishing much special train service for local excursion business, especially where lines are crowded with regular trains, both freight and passenger, it is my belief that, with proper facilities, a large additional revenue can be secured from this class of business that would otherwise not be received, and that the traffic can be handled in such a manner as not to interfere materially with regular business. Experience has demonstrated this to be true not only in thickly settled communities where there is a large population to draw from, but in regions that, comparatively speaking, are sparsely settled, for the reason, as applicable particularly to the latter, that regular train service is generally inadequate to handle general excursion business going and returning the same day, on account of the regular trains being few and far between. On one Western line, where considerable attention has been given during the past four years to working up local special train excursion business, the earnings from this source have increased during the period named 100 per cent., amounting, in the years 1889, 1890, 1891 and 1892 to $35,000 $40,000, $60,000 and $70,000, respectively, but the figures that tell the story are those representing the earnings per train mile, which, during the same years, have been as follows: $1.32, $1.45, $1.83 and $2.01, and as the earnings per train mile, during the same period, of regular trains have averaged between 80 and 90 cents per mile, the conclusion is obvious that there is money in the business. It is true, however, that among most operating officials there is a disposition to object to the running of any more special trains, or the use of motive power therefor, than are absolutely necessary, and a general disposition to curtail special train service in every way possible. Of course the responsibility and risk increase to some extent with every additional train placed on the line, special or regular, but with the present improved facilities and methods there should be no more objection, on principle, to furnishing special train service, if it can be made to pay, than to doing any other kind of business that will pay. It is, or should be, largely a question of ability to furnish motive power and equipment, and ability on the part of the traffic department to show that the earnings are likely to reach at least a fixed minimum supposed to cover cost of operating, and a little more. The record of the traffic department, where continued, as in the case referred to, for a number of years, and where a general and quite large increase has been continual, as the result of careful attention and methods of working up and handling the business, ought to count for a good deal with the operating department in determining whether the motive power and equipment can properly be assigned to proposed service or not; but, generally speaking, except during certain periods when there are large crops to be moved which must be handled at once, requiring all the motive power available, the operating department should be expected to furnish whatever power the traffic department might call for; responsibility for success or failure to rest with the latter. . . . Changes in time schedules are seldom made nowadays without the concurrence of the passenger department. It should be the universal rule.

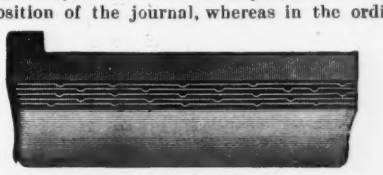
It is perhaps unfortunate for our branch of the service that many of our managing officers give more thought to the revenue to be derived from freight traffic than to the revenue to be obtained from passenger traffic. It is generally true that the gross income from freight traffic is greater than that derived from passenger traffic, but "on equal terms a man ships his freight over the route which he patronizes when he travels." A prominent general freight agent says: "The great miscellaneous through freight traffic—that which is most desirable—is largely controlled by the road that has popularized itself for through passenger traffic; an unpopular passenger road is never popular for freight traffic." Give our patrons the best passenger service that can be furnished, and we shall not only induce them to travel more frequently, but we shall add to the revenues of the freight department, and by putting money into the treasury of the company from all sources of traffic, we shall establish the fact that dividends *originate* with the passenger department, and for that reason we feel assured that our managing officers will, some day, concede that while it is desirable that co-operation should exist between all departments, it must exist between the traffic and operating departments.

* Extracts from a paper read before the American Association of General Passenger and Ticket Agents, at Harrogate, Tenn., March 21, by Geo. H. Heafford, General Passenger and Ticket Agent of the Chicago, Milwaukee & St. Paul.

The Shimer Journal Bearing.

The accompanying illustration represents a journal bearing which is made by the Shimer Bearing Co., of Bethlehem, Pa., and which has been found to give good service, nearly 100,000 bearings being now in use.

The principle of this bearing is an amplification of the lead lined bearing. The lead is so applied that it has considerable thickness and will continue to present a wearing surface until under ordinary circumstances the brass is worn out. The actual bearing surface, therefore, is always composed of soft metal adjustable to the form and position of the journal, whereas in the ordinary



LONGITUDINAL SECTION.

lead-lined bearing the lead only lasts a certain time, when the bearing is taken on the brass which cannot adapt itself to any further change in the journal.

It is now generally recognized that an admixture of

CROSS-SECTION.

The Shimer Journal Bearing.

lead is a valuable addition to bearing metal and that lead has singularly valuable anti-friction properties. This is somewhat of a paradox, as lead is so soft that even when rubbed with the finger small particles are dislodged and stain the hand. Yet its durability and power to resist wear under heavy pressure are undoubted.

The body of the Shimer bearing is made of an alloy of

copper, tin and lead, giving the requisite strength. This is then filled with alternate thin layers of pliable sheet metal and lead. This combination when placed approximates to the condition of an ordinary lead-lined journal, and soon beds itself to a fit.

The several thin layers of lead are closed along the sides of the bearing by lapping the upper layer of sheet metal over the edges of the other layers, and riveting them securely to the bearings with copper rivets prior to filling in the lead. The several sheets of metal are first corrugated to regulate the spacing and thickness of the several layers, and tinned over to guarantee in the casting the formation of one solid filling. A car bearing filled in as described, with several layers of lead instead of one lining of lead only, adjusts itself to the varied positions it must take during its entire term of usefulness. It is continually finding a seat, so to speak, whereas a brass bearing lead lined only, when the lining is used up, cannot again adjust itself to any change that may occur by reason of sudden jars.

High Speed on Railroads—From the Maintenance of Way and Engineering Standpoint.

Last December Mr. C. S. Churchill, Engineer of Maintenance of Way, Norfolk & Western, read a paper under the above title before the Engineers' Club of Philadelphia. It appears in full in the January *Proceedings* of the Club, with discussion by Mr. Trautwine. We have mentioned this paper before and particularly Mr. Trautwine's discussion; but there are many points of permanent interest in it which warrant us in giving considerable space to extracts from it. For speeds of 100 miles an hour Mr. Churchill would fix his grades at 20 ft. per mile with a possible 30 ft. in exceptional cases, and would make two degrees the sharpest curve.

Roadbed.—It is already found that for high-speed service four tracks are necessary, and certainly any section of the country requiring a speed as great as 80 or 100 miles an hour, will furnish not only a large passenger business, but also a large freight business, and high speed passenger service must be kept on tracks separate from the freight service. This makes evident at once the necessity of a four-track railroad. Tracks should be placed at least 13 ft. centre to centre, with ditches along the outside tracks at least 7 ft. from the edge of the rails, and the slopes of cuts and fills in earthwork should be 1½ to 1, and all the earth cuts should be thoroughly sodded. Rock cuts should be taken out at a slope of ½ to 1 and be thoroughly cleared of all loose material. Loose rock cuts should be taken out at a slope varying from ½ to slope of 1 to 1, as the material may require for stability. Berm ditches should be provided at the top of all cuts. In fact, every precaution must be taken to protect the roadbed.

Preferably, for safety at least, the freight business should be handled on the outside tracks, and the two middle tracks should be retained for passenger business. Tile drains should be placed in cuts between the passenger and freight tracks, to thoroughly drain the roadbed under the passenger tracks. All embankments should be carefully built of material taken from the cuts, carefully placed at a slope of not less than 1½ to 1. The edge of the roadbed should be limited by a line seven feet from the outside rail of the outside tracks. No open culverts should be allowed in any case. . . . No farm road, highway or street should be crossed at grade, as at the proposed speed it would be practically impossible to give the necessary warning to people crossing the tracks. It would further be impossible to check the speed at every street or highway. Finally, as a further safety to the traffic, all of the right of way should be substantially fenced, the posts of such fence being not further apart than 8 ft.

Bridges.—The grades should be arranged with a view to using stone arches over streams, farm crossings, highways and streets wherever it is possible to secure them. . . . Wherever for some particular reason it is impossible to build a stone arch bridge, plate girder bridges with buckle-plate floors should be used, up to a span of 100 ft. For various spans requiring truss bridges, riveted trusses are preferable, at least up to 120 ft. span, and pin-connected trusses for spans above this. All these bridges, however, should be provided with buckle-plate floors.

Track.—Tracks should be spaced 13 ft. centre to centre. Ties should be white oak, hewed to a thickness of 7 in. and having a face 7 in. wide, each tie being 8½ ft. long; 3,000 ties should be used to the mile, and never less than 2,800. . . . A road intended for any higher speeds than those at present used, should be laid with rails weighing 100 lbs. per yard. The rail should have a good height in order to be rigid, and it should have a a wide base in order that it may not cut too rapidly into the ties. A rail 5¾ in. high, with a 5¾-in. base and a head 2¾ in. wide, is one filling such requirements. About 25 per cent. of the accidents at present occurring, other than collisions, are due to bad track. These defects are generally either traceable to insufficient ties, defective ties, light rail, bad joints, or inseeure fastening of the rail to the ties. At least 2 per cent. of such accidents are due to the joints themselves. Hence, the number of joints in our track should be reduced to as low a number as possible. Rail mills are now able to produce rails readily in 60 ft. lengths, and there is no reason why rails of such lengths should not be used, thereby avoiding 50 per cent. of the joints in the track. An expansion of ½ in. is sufficient for a rail 60 ft. long, and this space cannot be said to be a serious objection, providing a secure fastening of the joints is furnished. However, much smoother riding track will be secured by the adoption of the mitre joint, *i. e.*, rails cut an angle of 45 deg.

The form of splice to adopt for such a road is one of the most important questions. . . . The rail should be supported at the joint from beneath, as well as under the head. . . . The splice in use on the Norfolk & Western Railroad in connection with an 85-lb. steel rail is similar to the splice illustrated in Vol. VIII., No. 4, of these *Proceedings*. Such a joint as this can be applied either to a mitred joint or to a square-jointed rail, and it is certainly the only form at present devised that can be said to be safe for a speed of 80 or 100 miles per hour.

The present use of spikes for fastening rails to the ties has the single argument in its favor that the fastening is quickly made. The fastening, certainly, is not secure, and is not satisfactory. The insecure fastening of rails to ties is certainly, the indirect cause of many accidents. . . . The Bush interlocking bolt seems to be the simplest device for securing a very effective and rigid fastening of the rail to the ties. This device, or some similar one, will be necessary on any railroad where speeds are used as great as 80 or 100 miles per hour. . .

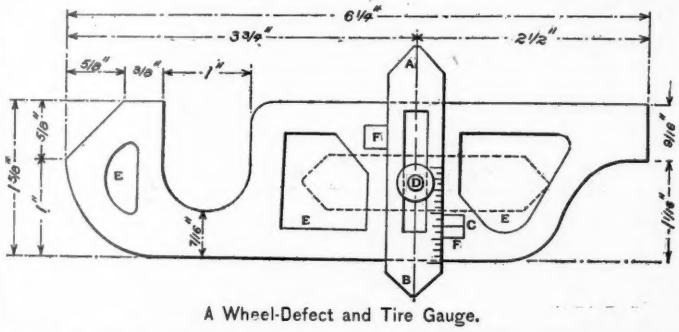
Across all through bridges the track should be protected by guard rails on the inside of the track, the clearance between the guard rail and the main rail being 7 in. Switches should be as few in number as possible. . . . Spring-rail frogs seem to answer the requirements from our present point of view. These frogs should, however, be of improved pattern; they should be built on a ¾-in. plate, the wing rail should have the spring placed near the end, should have a lever to hold it in position, and the top of the wing rail should be beveled to prevent a possible forcing open of the wing rail by badly worn engine tires.

All switches should be guarded by distant signals, so placed that trains running even at 100 miles per hour could be stopped before reaching the switch, in case the signal was at danger.

DISCUSSION.

Mr. Churchill's discussion, which follows, is in reply to questions raised by Mr. Trautwine.

The space ½ in. at the joint of a 60-ft. rail is, of course, the maximum. In practice it varies from 0 in. to ½ in., an average of ¼ in. This is not a serious matter with good joint fastenings, but is of moment with poor fastenings. The above is my experience, thus far, with 60-ft. rails with square ends. My experience with 60-ft. rails with mitre-cut ends indicates that a very great improvement in track is secured by this simple device alone. With good joint fastening the joints can scarcely be detected while seated in a car.



A Wheel-Defect and Tire Gauge.

The Noonan Track.—As to the possibility of securing continuous rail, I do not think it is probable in connection with railroads. It is more possible with street railroads, as the traffic and loads are very light compared with railroads, and as the rail is very much protected from effects of temperature by being surrounded by paving. The experiment made by Mr. Gleaves, near Lynchburg, was on the Lynchburg & Durham Railroad. That road is now one of the leased lines of the Norfolk & Western Railroad, and consequently I am prepared to give the results of that experiment. I made a personal examination of this experimental track during November, 1891. My report reads as follows:

"Near Gladys is a section of three miles of track put up on the so-called 'Noonan System.' The rails have been riveted together at the joints for the whole distance of three miles, and at each end of the three-mile section is a point switch arranged so as to take up the expansion of the three miles of continuous rail. None of the rails are spiked close to the ties, but there is a little play allowed between the flanges of the rail and the under side of the spike head. The ties are completely covered with light earth from the adjacent cuts; in fact, nothing is seen on this section of track excepting the heads of the rails. This track was put up about one and a half years ago. It is now, however, in poor line and surface and it will soon be necessary to remove all the top filling and resurface it, the same as any piece of track. The only advantage secured, therefore, by this system of track is smoothness at the joints, due to the rails being riveted together."

I have a report to-day from the Superintendent of the Durham Division of our road in regard to this piece of track. It is as follows:

"Owing to the ties being buried they are water-sogged, consequently they are very much sap-rotted and probably 50 per cent. of them will have to be renewed during 1893. The expansion switch points evidently do not work satisfactorily, as the track is badly kinked, more especially during summer. Track also gets out of surface frequently; so you can well imagine what an expensive job it is to resurface it."

From the above it is to be noted:

(1) That ties are quickly destroyed when covered in the manner required in the so-called "Noonan track."

(2) That expansion of rails cannot be disregarded, even though the track is buried as much as possible, and thus protected from the changes of temperature.

(3) Expansion of a long section of track cannot be carried successfully to one point, even when spikes are kept loose for the purpose.

(4) The track does not remain in the surface, even under comparatively light traffic, as well as ordinary track, and it is very expensive to restore it to the surface.

(5) Therefore the experimental "Noonan track" is a failure.

Wheel-Defect and Tire Gauge.

An engraving which appears on this page shows a combined wheel-defect and tire gauge which has been sent to us by Mr. M. K. Barnum, an officer of the Union Pacific at North Platte, Neb. Mr. Barnum says that he has used one of these gauges for the past six years and finds it the most useful tool that he has. A similar gauge has been patented, but lacks many of the best points of the one that is shown here. This is light, compact and handy. It covers all the points of the Master Car Builder's wheel-defect gauge, the functions of which are too familiar to need to be pointed out here. The sliding scale, *A B*, is so made and graduated that the end *B* is used for measuring the wear of flanged tires, and the end *A* for plain or "blind" tires, taking the reading in each case from the line *C*, but using different ends of the graduation on the scale. The gauge and scale are both made of steel No. 18 or 20 wire gauge, and the scale can be revolved around the stud, *D*, into the position shown by the dotted lines, which makes it somewhat more compact for carrying in the pocket. The gauge is cut out at the places marked *E* to make it lighter.

The Southern and Southwestern Railway Club.

The regular quarterly meeting of this Club was held at Atlanta, Ga., on Jan. 19, Mr. A. W. Gibbs (Central Georgia), Vice-President, in the chair. Over 30 members were present.

REDUCTION OF OIL CONSUMPTION ON ENGINES AND CARS.

Messrs. T. W. Gentry, A. T. Hooker and James Cullen, the committee on this subject, made the following report:

Some form of oil cup, with a feed arrangement, either fixed or adjustable, should be used at every point where there is sufficient motion to insure proper working, such oil cups being made in as few parts as possible. Axle and crank-pin journals, eccentrics and parts of valve gear subject to wear should have large and long bearing surfaces, with one of the best composition metals or bronze bearings, with properly arranged and proportioned oil holes; and pockets for large bearings and reliable feed cups for small bearings will reduce heating and prevent excessive use of oil to cool off hot bearings. Automatic or sight feed lubricators and good oil should be used for slide valves and cylinders. Simple but correct performance sheets that can be easily understood by runners will promote economy. Excessive oil consumption is largely due to slack methods of issuing supplies and failure to provide suitable cans for carrying and applying oil on engines. The general practice is to use good heavy car oil and waste mixed in proper proportions for all classes of cars. No road uses grease on freight cars and few on passenger cars and tenders. Two gallons of a good quality of heavy car oil, well mixed in tanks, with one pound of chopped wool waste, makes the best lubricant for cars. Cotton waste, if used, should also be chopped, for chopped waste absorbs more oil and presents more fibrous ends for a capillary attraction. An intelligent packer can put just enough into the box, while with long stringy waste he must put too much or too little. It also prevents waste of oil, since the greaser can handle it without his bucket. The chopped waste cannot wind round a rough journal. A cheap device for cutting up waste is much wanted. The escape of oil in hot weather can be prevented by better fitting dust guards and box lids and by the use of a very heavy oil in summer. Dust guards and lids should receive closest attention, and bearings should be removed before they wear sufficiently to leave an opening at back of box. More attention should be paid to proper design and construction of journal boxes, especially as regards room for packing and good fit of dust guards and lids. As size of car journal bearing is fixed by M. C. B. standards, the only improvement possible is in material. A bearing of good metal, well lined with lead, will run cool if properly oiled at starting. Lead lined bearings generally run cool on hot journals and should be supplied to conductors for use on road in emergencies. Waste should not be issued dry but ready mixed with oil as dope in tanks well covered with oil. The "dope," or packing buckets, should be provided with a scoop or projection to go under the box far enough to catch drippings from lid, and in either packing or simply oiling care should be taken not to flood oil out at dust guard; it is simply a useless waste of material. Neither the bucket nor can should be too large, but of convenient size when filled to allow the greaser

taking both along with him. When the capacity of these vessels is limited, the greaser will be more careful as to quantity applied.

The following form has been used for many years by Mr. A. G. Steinbrenner (American Refrigerator Transit Co.):

COMPARISON OF OIL AND WASTE USED ON PASSENGER AND FREIGHT CARS, MONTH OF .... .

	Name of division.	Gallons lubricating oil.	Pounds waste.	Total cost.		Total car mileage.	Cost per car per 100 miles.	Cars hauled per quart.	Comparison same month last year by percentage.
PASSENGER.	A. & B.....								
	C. & D.....								
	E. & F.....								
	All divisions.....								
FREIGHT.	A. & B.....								
	C. & D.....								
	E. & F.....								
	All divisions.								

Mr. E. M. Roberts (South Carolina) read the following paper on the subject:

Hot boxes are expensive in brasses, oil, packing, axles injured, and especially in delays and increased fuel consumption. Hot bearings can be prevented by attention to the three following points:

1. Bearing metals should be made from new copper and new tin. Bearings made by melting over old bearings and scrap brass, or even old material mixed with new, never give good results. It is poor economy to remove bearings as soon as they are worn through the ⅛ in. lead lining, which is more likely to occur when scrap metals are used as a whole or part in mixtures of brasses. The ready market and the price for old material does not justify this questionable economy. When proper material is used in body of brasses, the lead lining allows the brass to gradually adjust itself to unequally worn journals, and to conform perfectly to shape of journals, without heating if properly oiled, and in stead of a few hundred miles of service from bearings we should obtain many thousand. Making bearings requires care and intelligence, for the same ingredients differently treated will give alloys varying greatly in their physical properties.

2. Lubricant should be of good quality of "well oil," and have a viscosity capable of keeping apart the surfaces of the bearing and journal, under the conditions of maximum weight with a small arc of contact, at a temperature considerably above the temperature of the atmosphere. An oil to meet above requirements, as well as the most exacting service, can be obtained from 11 to 13 cents per gallon.

3. Packing should consist of a good quality of wool waste with long threads, free from knots, and sufficiently loose and elastic to absorb the oil and to exercise its capillarity.

Efficient dust guards are practically unattainable.

All boxes should be examined at inspection and terminal points; all cars should be put in good condition as relates to oil boxes before movement. The packing should be well stirred up, particularly at the back of box, where the packing is usually hard and dry, while front of box shows packing loose and well saturated with oil. New bearings and new packing should be applied where required.

Dry or partially soaked waste should not be placed in box and the oil then poured in, as it is not absorbed and runs to the bottom, and the box is hot before the waste can exercise its capillary action. The waste should be thoroughly saturated with oil for several days before using. Supervision should be exercised over men, and the material kept under lock and key.

Reports should be furnished by the transportation department of every case of hot boxes; these reports referred to each inspector this car passed; and particularly to point car originated, requiring a written statement of the condition received, and attention given the car. This plan assists in locating neglect, and is an incentive to the men for careful attention.

Poor material and bad attention cause 90 per cent. of hot boxes, and 10 per cent. are due to mechanical defects or to cars starting from points where no attention is possible. The greatest freedom from hot boxes is the means of greatest economy in oil.

Last year we ran a fast fruit from Charleston to New York, 844 miles, in 48 hours. We ran 1,688,000 car-miles with 10 hot boxes, the maximum delay being 12 minutes. Our passenger trains rarely have hot boxes, though our road is ballasted with sand. Hot boxes which occur are nearly always caused by an imperfect journal, either unevenly worn or flaws in metal. We take out axles that get hot more than once. The cost of oiling our cars: Per 1,000 miles on passenger, 24.4 cents; freight 12.7 cents; general average, passenger and freight, 14.6 cents.

Mr. J. B. Michael (East Tennessee, Virginia & Georgia) wrote as follows on the very successful system of oiling engines and cars on that road:

1. We have standard oil cans for all grades of oil carried on engines—cylinder, lubricating, signal, and headlight. Firemen are required to draw all supplies, the oil tickets being made out at the oilhouse for that particular trip, as per the oil schedule, which allows a given quantity of oil for a specified run. The man in charge of the oilhouse (who is very reliable) checks the oil tickets with the run it is made out for, and issues that allowance only. No person is allowed to draw supplies for an engine except the fireman for that engine, and no oils are drawn that are chargeable to engines outside of regular or extra trip supplies, without an order from the foreman of roundhouse, who has very positive instructions to avoid doing this unless it is absolutely necessary.

2. The man in charge of the oilhouse sees that all supply cans presented at the oilhouse are in good order before issuing supplies; those in bad order are sent to the repair shop at once, and other supply cans of same standard issued in their stead, in good order. No oil cans are permitted to leave the oilhouse without stoppers. A percentage of the oil issued for the trip is often saved, and in such cases the engineer keeps it in a separate can for emergencies. All supplies are drawn from the oilhouse, night and day, by the fireman after he is called to go out, the crew having one hour to get their engine ready. This practice, in connection with having all tool and supply boxes on our engines furnished with locks (the keys of which are deposited in a case in the office of roundhouse foreman on the arrival of engines), prevents the possibility of any oil being stolen. Employés in roundhouse are not permitted, under any circumstance, to use oil cans or tools belonging to engines while laying over in the house. We do not issue supplies for round trips, except with passenger engines and freight engines running on short runs where they double back immediately on arrival. Freight engines on long runs draw supplies at both ends of the division. We found this a very large saving in oils. Where oil is issued to freight engines on long division runs for the round trip, engineers will get out of oil before they get back, causing trouble from cut valve seats or cylinders, hot pins, boxes, etc.

3. A regular man fills, trims and cleans all headlights, signal lamps, or markers, and cab lights. Where he finds defects he has necessary repairs made at once, or replaces them with exact duplicates. All irregularities or defects caused by carelessness on the part of crew are reported to roundhouse foreman, who submits same to master mechanic's office for investigation.

4. All oil cups and oiling appliances on engines are standard cups for special places. All cups, except those oiling pistons and valve stems, where metallic packing is used, have an established or standard feed, which cannot be altered by the engineer. Oil cups with adjustable feeds, regulated by the engineer, are very expensive, and cannot be kept in repair so far as a standard applies. Engineers, as a rule, do not have the fine judgment of a trained mechanic in adjusting them, and oil cups of this class are fitted up generally with a very fine adjustment; the parts, being very small, require small wrenches and some skill in adjusting. With the cups we now use, a small brass wrench is furnished each engine for removing the tops, which are 1¼ in. square, and yet we had occasion to discipline engineers and firemen for using an 18-in. monkey wrench. A standard feed cup is the most economical, owing to its cheapness in construction and saving of oil. It is false economy to put expensive oil cups on an engine where they are liable to be broken off or lost, which is a very common thing, especially with side or parallel rod cups. Two-thirds the oil previously used on eccentric straps has been saved by the adoption of our standard cup, with an established feed of ¼-in. lift blank screw feeder. Eccentrics used to run warm, especially on passenger engines, continually closing straps and ruining both eccentrics and straps. The old style oil cellar was used filled with packing, which fed sometimes right and then wrong, causing the parts to get dry and warm, cutting until the cellar was filled again, when the same condition was repeated. Engineers used to oil eccentrics at all regular oiling places, and very often between them; they required an unusual and unnecessary amount of oil. Our standard cup on eccentric straps has given excellent results, making round trips with one filling and far less repairs. One drop of oil at the right time and place is as good as one hundred.

5. A good, plain and serviceable automatic feed oil cup should be used on every available place requiring lubrication, and the feed adjusted permanently for the specific work required. Cups, the feed of which is adjusted by the engineer, are more or less abused, and are more often out of order than otherwise; and cups the feed of which has to be shut off after engines have made a trip are often neglected, and a very large per cent. of oil wasted. Where engines are run with regular crews, as is the case on our system, much better results can be obtained than when they are run otherwise. In the latter case it is absolutely necessary to have oil cans and supplies looked after by a reliable man; oil holes and cellars opened and repacked regularly. Firemen, as well as engineers, should be taught and encouraged to be as saving as they possibly can in oiling engines, as firemen do as much oiling as the engineer (a practice which we do not indorse entirely); but as we promote our firemen to engineers, when needed, it is necessary that they should be interested in the economical use of supplies.

6. We allow so much oil to so many miles for passenger, freight, work and switch, making distinctions between the different classes. We consider 30 to 35 miles to a pint of lubricating oil, and 100 to 125 miles to a pint of cylinder oil, good service for heavy passenger engines on heavy trains; a better showing can be made with light engines in light service, especially in the amount of cylinder oil per mile used, our record showing as much as 200 miles to a pint used. For freight, consolidation engines, 25 miles to a pint of lubricating oil and 75 to 100 miles to a pint of cylinder oil is good service. Ten-wheel engines in freight and work train service, doing lighter work, use proportionately less oil, and make some better showing. For switch engines 45 to 50 miles to a pint of lubricating oil and 125 to 150 miles to a pint of cylinder oil is good service. All supplies are issued upon this basis, and include all sponging of engine and tender boxes. A separate record is kept every month of the amount of oil and waste used in packing the different cellars in engine truck, driving and tender boxes, and each engine is charged with what is actually consumed by that engine. Tender boxes are inspected each trip, and sponging stirred up, no oil being used unless sponging is dry or box warm. A tender box should run 100 miles to one oiling.

7. We have established regular oiling points for passenger and freight cars, doing away with the old practice of indiscriminate oiling. All passenger and freight trains are inspected on their arrival, the oil box lid raised and sponging stirred up. If the box is not warm, and the sponging oily, we don't oil it. If the box runs warm and the sponging inclined to be dry, we oil it.

8. At all points, where inspectors are located, the oil and waste are mixed up in a tank in the proportion of 4 lbs. of waste to 1 gallon of oil and used as sponging. The sponging is issued in this form to all train crews, both passenger and freight, no oil being used for lubricating purposes whatever except in the form of sponging. The same rule applies to the care of oil cans with passenger and freight crews as that of supply cans for engines. The oil cans for passenger and freight cars have a very small opening, which prevents the wholesale deluging of oil box, which is generally the case now on some roads that are using oil cans for this purpose with much too large an opening. All oils at terminals and intermediate points are in charge of head inspector and under lock and key, no oil being issued by them except for the purpose of oiling cars.

9. Prior to our adopting the present system of issuing supplies to freight and passenger crews in the form of sponging, oil was issued. This was carried in cans, in many instances without stoppers and leaking badly. We would also find these cans upset and the contents spilled. Very little care seemed to be exercised by the crews in oiling boxes, as they frequently required packing, but instead the box would be filled with oil, a large per cent. running out the back of the box. This practice was ruinous, and we experienced considerable trouble in inaugurating our present system, but time proved that it was economically a great saving, besides reducing the delays beyond our expectations.

The average cost of oiling engines and passenger and freight cars per 1,000 miles on the system for the month of November is as follows: Engines, $1,739; passenger cars, $2,669; freight cars, $2,132; which we are not satisfied with, but we note a slow but steady improvement each month.

During the discussion which followed the reading of these papers, Mr. A. W. Gibbs asked if a thick oil could not be used in summer as well as in winter.

Mr. T. W. Gentry replied that waste would not absorb it, and in cold weather it would not run from cans. Mr. J. Cullen thought hot boxes were inevitable with cheap brasses costing 10 cents per pound. These brasses contained iron and other unsuitable material, and many roads used them to put under foreign cars. Mr. Gentry had found iron bearings under his cars. Mr. A. T. Hooker agreed with Mr. Hassman that faulty barrels were a great source of leakage, and that it was better to buy it in tank cars. He used small cans and found large journals 4½ in. × 8 in. used less oil than small journals.

Mr. Cullen had found Damascus or other good bronze save oil on engines, and Mr. R. D. Wade was using nothing but phosphor bronze on engines.

Mr. A. T. Hooker: In driving boxes there is more economy in applying the oil and covering with a lining of sole leather or felt, as it makes them almost air tight and makes a kind of suction.

Mr. McGee: Tin or babbitt lined bearings are not suitable for a sandy country, the sand embedded in the soft lining cutting away the journal.

Mr. J. Cullen stated that chilled dies were the best lining of crossheads. These dies are inserted in the crosshead and babbitt poured around them to hold them to a surface. The sharp edges are ground off before insertion. We put in four dies to compound eight-wheel engines, and they have given entire satisfaction.

Mr. J. S. Cook: We can all use better journals than we do now. Journals often break off, but the brass should be faced and chamfered on the end with a heavy chamfer so that it does not come in contact with fillet. Brasses without lead lining would certainly result in hot boxes.

The discussion on this subject then closed.

The Edgar Car Lubricator Packing.

The accompanying engravings represent a form of journal packing recently introduced by the Edgar Car Axle Lubricating Co., of Sunbury, Pa.

It is claimed that this form of packing can be easily adjusted and applied and that it is cheap and durable and suitable for long runs. Woolen or cotton waste or any other suitable fibre is formed into loose strands, tied in knots and the free ends cut as shown in fig. 3, three or four of these knots being used to pack a box as shown in figs. 1 and 2.

The fibres at the free ends spread and thus prevent the knot from untying, and also form brush-like extensions, which have great capillary power and are valuable for applying the oil to the journal. As the loops wear away by contact with the journal, the fibres of the loops are cut in two and spread apart, as shown in fig. 4, thus forming additional brush-like extensions, which increase the volume of the material and prevent it from sinking away from the journal. By occasionally inserting a rod into the box and stirring up the packing, as is now customary in using waste, new portions of loops will be brought in contact with the journal. It is claimed that a car will run longer without having the journal boxes repacked than is possible with the ordinary waste.

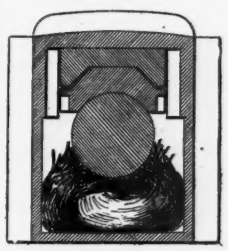


Fig. 2.

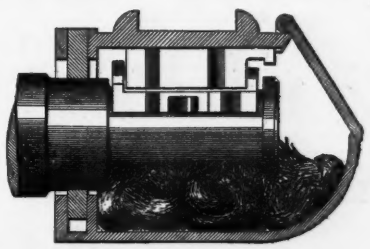


Fig. 1.

Fig. 3.

Fig. 4.

The Edgar Car Lubricator Packing.

It is claimed that the knotted balls remain where placed in contact with the journal, their *form* giving them elasticity, while with waste the only elasticity is that due to the material. If this claim be substantiated, it is evident that the knotted balls will remain efficient lubricators longer than waste.

A further claim on behalf of this system is that the condition of the packing is more easily ascertained by inspection. This packing has been tested with satisfactory results on several roads, the boxes running several thousand miles with one oiling.

The Cost of Steam Power with Engines of Different Types.*

A previous paper on this subject, read in 1883, is still substantially correct, but prices have changed. The present paper compares the cost of a unit of 500 net horse power from several representative types of engines. The speed has been assumed in all cases to be delivered at 250 to 350 revolutions of high speed engines and jack shaft speed of slow engines.

Expenses independent of coal are fairly constant, independent of the type of engine, and without considering interest or dividends, will in some cases equal the cost of coal. Comparing two economical engines, one effecting a saving of coal compared to the other of, say, 12½ per cent., makes the relative costs of fuel as 8 to 7; but if additional costs equal to the former be added to *both*, the relative economies will be 16 to 15, and the saving reduced to 6¼ per cent. simply by the summation of costs. If all expenditures should pay 10 per cent. dividends on capital invested and 10 per cent. of the difference in first cost of the engines equals an amount which represents a saving of 6¼ per cent. of fuel, then the cost to the owner of the steam plant will be exactly the same in the two cases, since in one case he will pay in additional interest or dividends on the capital invested the same sum as he will pay for additional fuel if he uses the cheaper engine. The cumulation of costs, other than for fuel or interest, reduces the saving due to economical consumption of fuel, and interest and dividends may neutralize percentages already made small from the first named cause. Original cost of plant is important where on one hand money is dear, or coal is cheap or work irregular. When interest charges are considered, the number of hours an engine operates in a year has a very important influence on the question of first cost, as such charges for a given steam machinery will be exactly the same whether the latter be operated one hour per day during part of the year or 24 hours per day for the entire year, and the interest will also be the same whether the coal used cost $1.00 or $10.00 per ton. The saving in the total cost of coal consumed, either during the short hours or at the low price per ton, will not warrant the adoption of high priced steam machinery.

Various other conditions operate to equalize the cost of different kinds of steam machinery. Smaller boilers are required with more economical engines and the saving in cost of boilers partly compensates for the higher cost of the engines. Coal is now cheap and economical engines, though lower than formerly, are still relatively high.

Modern steam engines may be divided into high-speed and low-speed engines. High-speed engines are of comparatively short stroke and develop approximately the same piston speed as long stroke engines by an increased number of revolutions. In most high-speed engines the steam is distributed and cut off by a lap valve operated by a governor revolving with the main shaft, which acts to move the centre of the eccentric in a line transverse to the crank at a distance from the centre of the shaft equal to the lead. The effect is to modify the cut off, as in the link motion, by reducing the throw so that the angular motion required to move the valve through its double lap forms a greater or less proportion of the whole motion and therefore varies the angle of steam admission while the lead is maintained substantially uniform.

In the table the engine on line *J* is designed for economy in construction rather than the highest economy in fuel. Engine *K* is a low speed triple compound and results are the best that can be attained under ordinary average practice, even with the best machinery. Engine *L* is operated still more economically, by means of boilers of unusual economy and careful firing, etc., $1 per day being added to labor account. Results are maximum with best care available. All engines are assumed to be reliable and no large allowance has been made for breakdowns. The total loss due to friction of the engine and jack shaft of the slow-speed engine is 10 per cent. and for the high-speed engines 8 per cent. Column *f* shows the feed water per I. H. P. per hour assumed for comparison. These figures can be depended upon in practice with varying loads affecting the economy. Engines with a uniform load will give lower results, but engines generating electric current for electric railways or subject to variable loads of any kind will rarely show economies as low as column *f*.

Column *g* shows the commercial horse-power (C. H. P.) of the boilers required to furnish steam to engines of the I. H. P. shown in column *c*. The power of a boiler is the quantity of water it will evaporate under normal conditions, and the C. H. P. of a boiler is 30 lbs. of water evaporated at 70 lbs. pressure at a temperature of 100 deg. Fahr. The price covers the cost of the better class of "safety boilers" in which the water is contained in tubes, small chambers, or comparatively small shells of unusual strength compared to the large shells of ordinary boilers. Tubular boilers are cheaper, and since increased economy is obtained by increased heating surface, ordinary tubular boilers are selected when large ratios of heating surface to grate are desired or boilers of the sectional type employed with economizers at the base of the chimney. Increased surface on tubular boilers chokes the draft. Tubular boilers have not the surplus power of sectional, and when the power varies greatly, as in electric railway work, a greater H. P. of boilers of the tubular type must be provided than of the sectional type. Vertical boilers with small tubes are cheap and efficient with steady work, but must be cleaned periodically.

The final result in the table is not due to the price of the boilers selected. Sectional boilers for pressures not exceeding 125 lbs. can be purchased and erected in place complete with necessary attachments, furnaces, brick walls, connections to chimney, steam and blow pipes and other connections, with firetools and fireroom fittings in place ready for regular use for $22 per C. H. P.; and to carry 150 lbs. and upward, at $25 per C. H. P.

The cost in column *h* is approximate. Column *J* is insufficient for elaborate buildings for architectural effect, but could be reduced by using cheap wooden structures.

Columns *G–N* show that for cheap fuel and short hours the engines of fair economy and least cost give the most economical results when both the cost of the fuel and collateral and interest charges are considered, and *the compound engines of comparatively moderate price show better economy, everything considered, than the higher priced triple compound engines*, if results shown in the last line cannot be obtained in average practice. The various devices which are being urged upon the owners of steam plants should not be purchased unless they will save 25 per cent of their cost annually. The columns of this table foot up two-thirds of this percentage and as the attention and repairs of miscellaneous apparatus is great, the additional percentage is fully warranted.

The comparison shows the non-condensing engines inferior at every point to condensing engines. Non-condensing engines are wasteful of fuel when heavily loaded on account of low expansion and at light loads the back pressure forms a large proportion of the total resistance, whereas condensing engines will maintain their economy through a wider range on account of the reduction of the back pressure. Back pressure affects the economy of triple compound engines when used non-condensing. Such engines (non-condensing) cannot for irregular loads show any economy over well designed compound engine (non-condensing) unless the steam pressure is carried to 200 lbs. or upward and the size of the cylinders proportioned to the average load.

Under some conditions within the limits of ordinary practice, the prices of economical types of steam machinery compared to price of coal and number of hours' operation, the saving in fuel does not warrant the increase of first cost. This should not be considered a criticism of the practice of others or serve to discourage the higher development of the steam engine, as an investigation of this kind, whatever the result, is calculated to broaden the view by taking into consideration more of the conditions of the problem, and thereby enabling the engineer to secure the best results for each particular case. The table shows for short hours or low priced coal, or both, that types of steam machinery to secure the greatest economy of fuel are not warranted, but for longer hours and the higher priced coal the more expensive machinery shows a commercial advantage which increases with the price of fuel. In some cases other conditions must be included for a complete solution of the problem. For instance, in large steamers making long voyages economical machinery secures, in addition to the saving in the cost of fuel, a saving in the space required to carry the machinery and fuel, and thus increases almost in a geometrical ratio the efficiency of the ships. The very large ex-

* Paper read by Mr. Chas. E. Emery, Ph. D., before the American Institute of Electrical Engineers, New York, March 21, 1893.

TABLE I.—COMPARATIVE COST OF STEAM POWER IN ENGINES OF DIFFERENT TYPES.

By Chas. E. Emery, Ph. D., New York, 1893.

a.	b.	c.	d.	f.	g.	h.	i.	j.		m.	n.	o.	p.
Designation.	TYPE OF ENGINE.	Indicated horse power to produce 500 H. P. net on engine shaft.	Steam pressure by gauge.	Feed water per indicated horse power p'r hour.	Commercial horse power of boilers. One C. H. P. equals evaporation 30 lbs. water at 70 lbs. pressure from temp. 100°.	APPROXIMATE COST PER NET HORSE POWER.				Water evaporated per pound of coal.	Coal per indicated horse power per hour.	Tons of coal (2,240 lbs.) per day with coal for one hour added for starting and stopping fires.	
				Ass'med.		Engines erected and connected.	Boilers erected and connected.	Buildings and chimney.	Total with 2½% per cent. interest and 6 per cent. interest during construction.			10 working hours per day.	20 working hours per day.
	Name.	I. H. P.	Lbs. p. sq. in.	Lbs.	C. H. P.	Dols.	Dols.	Dols.	Dols.	Lbs.	Lbs.	Tons.	Tons.
A.	Simple, high speed, non-condensing	542	100 to 120	33	596	17.50	26.22	15.18	63.91	8.5	3.882	10.332	19.725
B.	" low " " "	556	100 to 120	29	537	25.00	23.63	14.22	68.19	8.5	3.412	9.316	17.785
C.	Compound high speed, non-condensing	542	100 to 120	26	470	21.00	20.68	13.13	59.47	8.5	3 059	8.142	15.544
D.	Special triple compound high speed non-condensing	542	150 to 170	24	434	26.00	21.70	12.55	65.37	8.5	2.824	7.516	14.349
E.	Simple high speed condensing	542	100 to 120	22	397	21.00	17.47	11.95	54.71	8.5	2.588	6.888	13.1?0
F.	" low " "	556	100 to 120	20	371	27.00	16.32	11.53	59.51	8.5	2.353	6.425	12.265
G.	Compound high speed condensing	542	100 to 120	20	361	24.50	15.88	11.36	56.14	8.5	2.353	6.263	11.9?6
H.	" low " "	556	110 to 125	18	334	30.00	14.70	10.92	60.35	8.5	2.118	5.783	11.040
I.	Special triple compound high speed condensing	542	150 to 170	17	307	29 00	15.35	10.49	59.50	8.5	2.000	5.323	10.163
J.	Triple compound low speed condensing	556	150 to 170	16	297	37.50	14.85	10.32	68.00	8 5	1.882	5.139	9.810
K.	" " " "	556	160 to 170	15	278	45.00	13.90	8.35	72.97	8.5	1.765	4.819	9.200
L.	Do. for probable maximum results	556	160 to 170	14	259	45.00	12.95	8.15	71.72	9.5	1.474	4.025	7.683

a	q	r	s	t	u	v	w	x	y	z	A	B	C	D	E	F
	COST OF COAL PER HORSE POWER PER YEAR.								Cost per net horse power per year.							
	308 days, 10 hours, cost of coal per ton of 2,240 lbs. delivered.				365 days, 20 hours, cost of coal per ton of 2,240 lbs. delivered.				Supplies and repairs.		Wages.		Insurance, taxes, renewals total 5 per cent. of cost.	Interest, 10 per cent. of cost.	Total cost per horse power per year, all expenses except coal.	
	$2.00	$3.00	$4.00	$5.00	$2.00	$3.00	$4.00	$5.00	308 days, 10 hours.	365 days, 20 hours.	308 days, 10 hours.	365 days, 20 hours.			308 days, 10 hours.	365 days, 20 hours.
	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.
A	12.73	19.09	25.46	31.82	28.80	43.20	57.60	72.00	2.96	7.01	4.78	11 34	2.95	6.39	17.08	27.69
B	11.48	17.22	22.96	28.69	25.97	38.95	51.93	64.92	2.53	5.99	4.49	10.65	3.14	6.82	16.98	26.60
C	10.03	15.05	20.06	25.08	22.69	34.04	45.39	56.74	2.96	7.01	4.16	9.87	2.74	5.95	15.81	25.57
D	9.26	13.89	18.52	23.15	20.95	31.42	41.90	52.37	2.96	7.01	3.99	9 45	3.01	6.54	16.50	26.01
E	8.49	12.73	16.97	21 22	19 20	28.80	38 40	48.00	2.96	7.01	3.81	9.02	2.52	5 47	14.76	24.02
F	7.92	11.87	15.83	19.79	17.91	26.86	35.81	44.77	2.53	5.99	3.68	8.71	2.74	5.95	14.90	23.39
G	7.72	11.57	15.43	19.29	17.46	26.18	34.91	43.64	2.96	7.01	3.63	8.60	2.59	5.61	14.79	23.81
H	7.13	10.69	14.25	17.81	16.12	24.18	32.24	40 30	2.53	5 99	3.49	8.28	2.78	6.04	14.84	23.09
I	6.56	9.84	13.12	16.40	14.84	22.26	29.68	37.10	2.96	7 01	3.36	7 97	2.74	5.95	15.01	23.67
J	6.33	9.50	12.66	15.83	14.32	21.48	28.65	35.81	2.53	5.99	3.31	7.85	3.13	6.80	15.77	23.77
K	5.94	8.91	11.87	14.84	13.43	20.15	26.86	33.58	2.53	5.99	3.22	7.63	3 36	7.30	16.41	24.28
L	4.96	7.44	9.92	12.40	11.22	16.83	22.43	28.04	2.53	5.99	2.74	8.87	3.31	7.17	16.75	25.34

a.	G.	H.	I.	J.	K.	L.	M.	N.	O.	P.	Q.	R.	S.	T.	U.	V.	a.
	TOTAL COST PER NET HORSE POWER PER YEAR.								TOTAL COST PER NET HORSE POWER PER YEAR FOR ELECTRIC R R. OR VARIABLE WORK REQUIRING 50 PER CENT. EXTRA PLANT TO OBTAIN 500 H. P. AVERAGE. Insurance increased to 1½ per cent., engine renewals to 4 per cent. and boiler renewals to 5 per cent.								
	308 days of 10 hours, cost of coal per ton of 2,240 lbs.				365 days of 20 hours, cost of coal per ton of 2,240 lbs.				308 days of 10 hours, cost of coal per ton of 2,240 lbs.				365 days of 20 hours, cost of coal per ton of 2,240 lbs.				
	$2.00	$3.00	$4.00	$5.00	$2.00	$3.00	$4 00	$5.00	$2.00	$3.00	$4.00	$5.00	$2.00	$3.00	$4.00	$5.00	
	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	Dols.	
A.	29.81	36.17	42.54	48.90	56.49	70.89	85.29	99.69	35.45	41.82	48.19	54.55	6?.14	76.54	90.94	105.34	A.
B.	28.46	34.20	39.94	45.67	52.57	65.55	78.53	91.52	34.55	40.28	46.02	51.75	58.65	71.64	84 61	97.60	B.
C.	25.84	30.86	35.87	40.89	48.26	59.61	70.96	82.31	31.10	36.12	41.13	46.15	55.52	64.87	76.22	87.57	C.
D.	25.76	30.39	35.02	39.65	46 9?	57.43	67.91	78.38	31.65	36.28	40.91	45.54	52.8?	63.32	73.80	84.27	D.
E.	23.25	27.49	31.73	35.98	43.22	52.82	62.42	72.02	28.08	32.32	36.56	40.81	48 05	57.65	67.25	76.85	E.
F.	22.82	26.77	30.73	34.69	41.30	5?.25	59.20	68.16	28.12	32.07	36.63	39.99	46 60	55.55	64.50	73.46	F.
G.	22.51	26.36	30.?2	34.08	41.27	49.99	58.72	67.45	27.48	31.33	35.19	39.05	46.24	54.96	63.69	72.42	G.
H.	21.97	25. 3	29.09	32.65	39.21	47.27	55 33	63.39	27.36	30.92	34.48	38 04	44.60	52.66	60.72	68.78	H.
I.	21.57	24.85	28.13	31.41	38.51	45.93	53.35	60.77	26.92	30.20	33 48	6.76	43.88	51.28	58.70	66.12	I.
J.	22.10	25.27	28.43	31.10	38.09	45.25	52 42	59.58	28.27	31.44	34.60	37.77	44.26	51.42	58.59	65.75	J.
K.	22.45	25.32	28.28	31.25	37.71	44.43	51.14	57.86	29.10	32.07	35.03	38.00	44.46	51.18	57.89	64.61	K.
L.	21.71	24.19	26.67	29.15	36.56	42.17	47.77	53.38	28.33	30.81	33.29	35.77	43.18	48.79	54.39	60.00	L.

penditures made by some mining companies to save fuel by the use of expensive steam machinery of special design have been fully warranted by the long hours and high price of coal. The enormous mechanical operations at the Calumet & Hecla mines gave the profession unequalled opportunities, which have been grasped in the most creditable manner by our distinguished co-laborer in the engineering field, Mr. E. D. Leavitt, who has reared there a series of remarkable monuments of engineering skill with an expense warranted, doubtless, by the conditions. The development of the great West is, however, now so modifying the conditions that the price of fuel has fallen nearly to the level prevailing at the Atlantic seaboard.

Submerged Tube Vertical Boiler.

The accompanying engraving represents a form of vertical boiler put on the market by Messrs. Fairbanks, Morse & Co., of Chicago.

This method of construction produces a boiler quite superior to the old form with full length tubes. The tube sheet and upper ends of tubes being under water, do not burn out and become leaky, and the combustion chamber formed in the top of boiler makes an excellent superheater. Particular attention is called to the bracing, which is very thorough, as shown in engraving, also to the improved form of ash pan and base. With this form of ash pan, water can be carried to cover the bottom, thus preventing burning out and warping under heat.

Train Accidents in the United States in February.

COLLISIONS.

REAR.

1st, on Lake Shore & Michigan Southern, near Stryker, O., a local freight train ran into the rear part of a preceding train which had been stopped by the breaking of a coupling; the collision exploded 2 carloads of powder, wrecking 3 cars and damaging the locomotive. The engineer and fireman had jumped off and no one was injured. Snow was falling fast at the time, and it is said that the flagman was not seen.

2d, on Norfolk & Western, near Flat Top Tunnel, Va., the cab of a locomotive caught fire and the flames were so threatening that the engineer and fireman jumped off. The train ran on and struck the rear of a preceding freight train near the entrance of the tunnel, making a bad wreck, which took fire. Several of the cars contained coke and made a very hot fire, which was extinguished only after a long fight.

3d, 6 a. m., on New York & New England, at East Douglas, Mass., an eastbound passenger train, which had just stopped at the station, was run into at the rear by a following passenger train, badly crushing the ends of 3 passenger cars in the foremost train. Four passengers and 1 engineer were injured. There was a dense fog at the time, and it appears that the flagman did not go back very far.

3d, 5 a. m., on Rome, Watertown & Ogdensburg, at McConnellsville, N. Y., a freight train which had become stalled in the snow was run into at the rear by a snow-plow, wrecking several cars and killing 2 men on the plow. A conductor was also badly hurt. The cars were empty and two or three of them were scooped up by the long slanting prow of the plow and landed on the roof. Five trucks crashed through the top of the plow. It is said that the rear brakeman of the freight went back with his red light, but that the light went out: that he then placed a torpedo on the track, but that the snow-plow was running very fast.

5th, on Cleveland, Lorain & Wheeling, at Beach City, O., a freight train ran into the rear of a preceding freight, wrecking 4 cars. The caboose took fire and was burned up, together with other parts of the wreck. The engineer was injured.

6th, 2 a. m., on Baltimore & Ohio, at Williams, Pa., a freight train became uncontrollable on a descending grade, and ran into the rear of a preceding freight, wrecking about 30 cars. The wreck took fire and a part of it was burned up. Three trainmen were killed and 2 injured.

6th, on Old Colony, at Leominster, Mass., a passenger train which had been stopped by the breaking of a wheel was run into at the rear by a freight train which approached at uncontrollable speed, making a bad wreck. The rear car was completely wrecked, but it was empty. The other cars, as also several in the freight train, were badly damaged and 4 passengers and 4 trainmen were injured.

7th, on Wabash road, near Catlin, Ill., a freight train ran into the rear of a preceding freight, wrecking an engine and several cars. A conductor was badly injured.

8th, 3 a. m., on Chicago, Burlington & Quincy, at Brush, Ia., a freight train standing at the station was run into at the rear by a following freight, making a bad wreck and killing many head of live stock. Four trainmen and 2 drovers were injured.

9th, on Pennsylvania road, near Middletown, Pa., a passenger train ran into some freight cars which had been blown out from a siding upon the main track, wrecking the freight cars and the forward part of the passenger train. Several passengers were injured.

9th, 2 a. m., on Fitchburg road, near Gardner, Mass., a freight train ascending a grade broke in two and the rear portion ran back into the head of a following freight, making a bad wreck. One conductor was killed and a brakeman injured.

9th, 11 p. m., on Grand Rapids & Indiana, near Manton, Mich., a freight train which had become stalled on a grade was run into at the rear by a passenger train drawn by two engines, wrecking a caboose and one car. A trainman under a car of the freight train repairing draw gear was injured, and a passenger in the caboose of the freight train was killed. This passenger had been out of the caboose, but went back. The foremost engineman of the passenger train was adjudged by a coroner's jury criminally negligent.

9th, on Minneapolis & St. Louis, near Minneapolis, Minn., a freight train standing on the main track was run into at the rear by a following freight, injuring the engineer.

10th, on Lehigh Valley, near Espy Run, Pa., a gravel train was run into at the rear by an empty engine, wrecking the caboose and 2 cars. Twelve employés were injured. The wreck took fire and some of the men were burned.

11th, on East Tennessee, Virginia & Georgia, near Atlanta Junction, Ga., a passenger train ran into the rear of a preceding freight. One passenger was killed and 2 trainmen injured. The flagman of the freight had not gone back far enough.

17th, on Chicago & Indiana Coal Railway, near Brazil, Ind., a freight train which had been stopped by another train ahead of it, was run into at the rear by a following freight, wrecking the caboose and several cars. Two trainmen were fatally injured and another badly hurt.

17th, on Central Vermont, at Ludlow, Vt., a freight train ran into the rear of a preceding freight, wrecking engine and 9 cars. The engineer was killed and the fireman injured.

18th, on Pittsburgh, Fort Wayne & Chicago, at Monroeville, Ind., a freight train ran into the rear of a preceding freight, wrecking the engine, caboose and several cars. Three trainmen were injured, 1 fatally.

19th, on Fitchburg road, near Athol, Mass., a freight train ran into the rear of a preceding freight, wrecking the engine and 12 cars. Two men in charge of horses were killed and 2 trainmen injured.

21st, on Philadelphia, Reading & New England, at East Walden, N. Y., a freight train ran into the rear of a passenger train, wrecking several cars and injuring 2 brakemen.

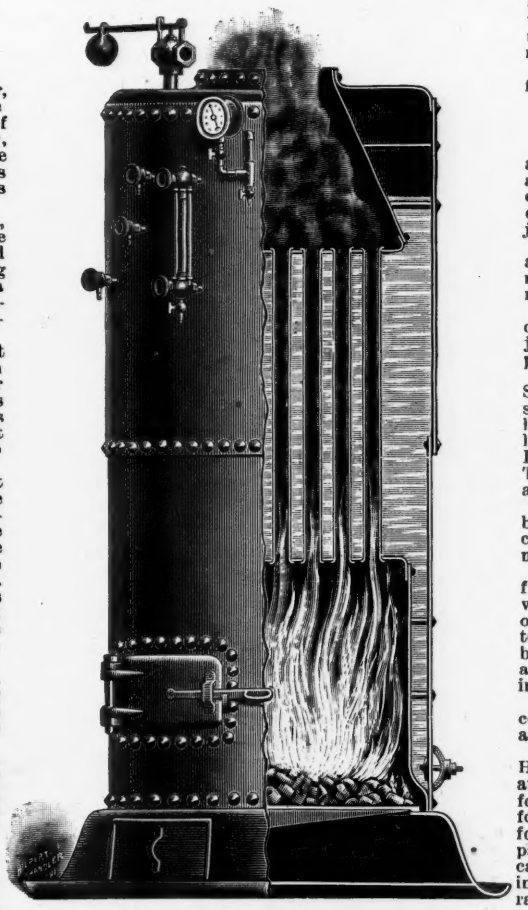
22d, 4 a. m., on Lake Shore & Michigan Southern, near Wickliffe, O., a train of empty passenger cars ran into an empty engine which was running backward. Its tender was thrown down a bank and the engineer was injured.

And 21 others on 16 roads, involving 4 passenger and 33 freight and other trains.

BUTTING.

1st, on Chesapeake & Ohio, near Bradford, Ky., butting collision of freight trains, damaging the engines and several cars. A tramp stealing a ride was killed.

2d, 3 a. m., on Pittsburgh, Fort Wayne & Chicago, near Loudonville, O., butting collision between a passenger and a freight train, wrecking the engines and several cars. Three trainmen were killed. It is said that the freight had left the preceding station on the time of the passenger train, without leave.



Submerged Tube Vertical Boiler.

Made by FAIRBANKS, MORSE & CO., *Chicago, Ill.*

4th, on Delaware & Hudson, near Susquehanna, Pa., butting collision of freight trains, 1 engine and 10 cars being thrown down a bank. One engineer was killed.

5th, On Valley road, at Cleveland, O., butting collision between a passenger train and an empty engine, damaging both engines and 3 cars. One engineer and 1 passenger were injured.

11th, on East Tennessee, Virginia & Georgia, at Olive Springs, Ga., butting collision of freight trains, in which 1 brakeman was killed and several other trainmen injured.

17th, 4 a. m., on Buffalo, Rochester & Pittsburgh, near Hoyts, N. Y., butting collision of freight trains, wrecking both engines and several cars. One engineer was killed. It is said that the northbound train had run a short distance past a meeting point in consequence of the brakeman losing control of the speed on a descending grade.

17th, on Wabash road, near Graham, Mo., butting collision between a passenger train and a freight, damaging the engines considerably. There was a brisk snowstorm at the time. Four trainmen were injured, mostly by scalding. It is said that the freight was running on the time of the passenger train.

18th, on Chicago & Northwestern, near Pecatonica, Ill., butting collison between an engine clearing the track of snow and a freight train. The engineer was killed and 3 other employés injured.

18th, 3 a. m., on Colorado Midland, near Bath, Col., butting collision between passenger trains, wrecking both engines and badly damaging 5 passenger cars. Four trainmen were killed.

19th, on Philadelphia & Reading, near Oak Lane, Pa., a southbound freight train ran into the head of a northbound freight which had been set off upon the south bound track, wrecking several cars. One brakeman was killed. It is said that a signal was properly shown to stop the south bound train.

21st, on Pennsylvania road, near Phœnixville, Pa., butting collision of freight trains, wrecking both engines and 14 cars. Three trainmen were killed and 2 injured. It is said that conflicting orders were given by the trainmaster.

21st, on Cleveland, Cincinnati, Chicago & St. Louis, near Columbus, O., butting collision between an empty engine and a passenger train. The empty engine, which had been reversed and deserted, at once started back and ran some distance through the city. It was finally ditched by a telegraphic order. A fireman was injured in the collision.

22d, on Burlington & Missouri River, near Lincoln, Neb., a westbound freight ran into the head of an eastbound freight, standing at the station, doing slight damage; the engineman of the eastbound train reversed his engine and put on steam just before the collision and then jumped off; the shock of the collision started the train backward, and it ran about a mile when it met an eastbound freight, making a bad wreck. Twelve drovers in the caboose and 2 trainmen were injured.

22d, on Baltimore & Ohio, at Birmingham, Pa., butting collision between a passenger train and a freight, damaging both engines. One passenger was injured.

27th, 1 a. m., on Baltimore & Potomac, at Washington, D. C., a passenger train ran over a misplaced switch at the junction of the double track and single track near the Potomac River bridge and into the head of a freight train, wrecking both engines. One fireman was killed and 1 engineer and 1 fireman injured.

27th, on Boston & Maine, near St. Johnsbury Centre, Vt., butting collision between freight trains, making a bad wreck. One engineer, 1 fireman and 1 other man were killed and a brakeman was injured. It is said that the northbound train had passed an appointed meeting place.

And 10 others on 9 roads, involving 6 passenger and 14 freight and other trains.

CROSSING AND MISCELLANEOUS.

14th, on Pittsburgh, Cincinnati, Chicago & St. Louis, at Wheeling, W. Va., a switching freight train ran over a misplaced switch and came into collision with an empty engine, wrecking several cars, some of which fell off a trestle. A brakeman and 1 other man were injured.

15th, on Cleveland, Cincinnati, Chicago & St. Louis, at Springfield, O., a collision of freight trains, due to a misplaced switch, resulted in the fatal injury of a brakeman and the less serious injury of 2 other trainmen.

20th, on Philadelphia & Reading, at Allentown, Pa., collision between a freight train and a yard engine, injuring an engineer and a fireman. It is said that a misplaced switch was the cause of the collision.

22d, on Philadelphia, Wilmington & Baltimore, at South street, West Philadelphia, a north-bound passenger train from the Central Division, crossing the main line, was struck in the middle by a north-bound main line express train and 1 passenger car was overturned. Four passengers were killed and 20 injured, 1 fatally. The main line train ran past a fixed signal which was against it.

25th, on Illinois Central, near Chicago, Ill., collision between a passenger train and an empty engine at a crossing. Both engines were overturned. Both engineers and 1 passenger were injured.

26th, on Atlantic & Pacific, near Billings, N. M., a freight train ran into the rear of a preceding freight which had entered a side track, but was not fully clear of the main line, wrecking a dozen cars. The wreck took fire from the stove in the caboose and part of it was burned up. It is said that sand was blowing so furiously at the time that the view of the engineman was greatly impaired.

27th, on Central of New Jersey, at Rockport, Pa., a collision of coal trains resulted in wrecking both engines and 15 cars. One brakeman was killed.

27th, on New York, New Haven & Hartford, at New Haven, Conn., a freight train standing on the Northampton Division, close to the junction with the Hartford Division (main line), was run into at the rear by a following freight, making a bad wreck and pushing the foremost freight forward so that it was struck by a passenger train on the main line. The engine and 2 cars of the latter were derailed and the engineer was injured. It is said that the second Northampton freight ran past a red signal.

And 8 others on 7 roads, involving 10 freight and other trains.

DERAILMENTS.

DEFECTS OF ROAD.

2d, on Chicago, St. Paul, Minneapolis & Omaha, at Knapp, Wis., 3 cars of a passenger train were derailed by a broken rail. The train was running at considerable speed, and the forward portion, which remained on the track, pulled the other cars along about 800 ft, until they came to a frog, which re-railed them. The trucks were not much damaged, but the cars had to be left. The porter of the sleeping car was slightly burned in extinguishing flames of leaking gas.

4th, on Colorado Midland, at Hilltop, Col., a passenger train was derailed by spreading of rails. One passenger was injured while trying to get through a window.

4th, on Northern Pacific, near Vining, Minn., a passenger train was derailed by a broken rail, and all the cars were overturned and fell down a high bank. Four passengers and 3 trainmen were injured.

4th, on Rome, Watertown & Ogdensburg, at Woodard, N. Y., 3 cars of a passenger train were derailed by spreading of rails and overturned. Several passengers were injured.

6th, on Cooperstown & Charlotte Valley, near Clintonville, N. Y., a freight train was derailed by spreading of rails, and 8 cars fell down a bank. A brakeman was injured.

7th, 11 p. m., on Cleveland, Cincinnati, Chicago & St. Louis, near Pana, Ill., a passenger train was derailed by a broken rail while running at considerable speed. Some of the cars fell off a trestle, and the wreck took fire from the stoves. The baggage master was burned to death, and 3 trainmen and 14 passengers were injured. It is said that a large amount of money was burned up in the express car.

9th, on St. Louis, Vandalia & Terre Haute, in Vandalia, Ill., passenger train No. 20 was derailed at a defective switch. The fireman was injured.

(*Continued on page* 231.)

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Railroad men speculate more or less over the possible changes in the policy of the brotherhoods in consequence of what has happened at Toledo. So far as can be judged by the present aspect of the case the most vital issue is between the law—that is, the whole people—and the brotherhoods; whether the latter may issue orders which virtually require a member to defy the law. This as an abstract question is an old one, as it has been up in many boycotts, but as applied to railroad work it is new. If a brotherhood is thwarted as an official body, will there be secret unwritten agreements to quit work suddenly? Vice-President Ashley, of the Ann Arbor road, suggests the desirability of a system of contracts, to be regulated by law. He would have enlistments for definite periods, oaths to obey the rules, 60 days' notice from either party desiring to terminate the engagement, etc. The New York *Evening Post* repeats its former plea for semi-military regulations in the railroad service, to be enforced by law. The weakness of this last lies, we think, in the impossibility of getting a reasonable law passed; and Mr. Ashley's plan will work much better if he puts it in force voluntarily, giving the men something to induce them to accept it, than if he asks the state to protect him. The vital point is that concerning the 60 days' notice. Most roads would object to binding themselves to so costly a notice. A shorter limit would probably be just as effective. Would men live up to their agreements? As we have intimated, and as we have before said, public sentiment will be slow to approve the punishment of employés as criminals for breaking a bargain which the employer can break with no danger of incurring anything worse than a money penalty. This being so, how shall the employé bind himself to do what he agrees to do? To deposit money would be the simplest plan. Thoughts of a $500 forfeit would completely neutralize many so-called grievances. The possibility of such a loss would not prevent dissatisfactions, but it would postpone *some* of them and give *time* a chance to operate as a curative. Of course a strong brotherhood could agree to pay forfeits for a hundred of its members, and if it did we should be simply exchanging small fights, and warfare somewhat after the guerilla fashion, for larger contests. This might not be a disadvantage, however. The most pressing need in the relations between railroads and their employés is to have the agreements lifted to a position where their importance shall be more constantly and thoroughly recognized by the railroad company. As we have recently said, there are still too many men in railroad offices who forget that in dealings about wages they and their employés are equals. Anything that will dignify and enhance the importance of contracts will tend to cure this evil. On the other hand, one of the hardest things to do is to protect the men against the tyranny of their own unions. In real suffering it is the men themselves and their families who fare worst in strikes—not stockholders or the public.

Judge Ricks' Injunction Against the Locomotive Engineers.

Perhaps no mandate of a Court of Equity in modern times has gone so far on untrodden ground as the recent injunction order of Judge Ricks, United States District Judge, in the Toledo, Ann Arbor & North Michigan case now pending in the United States Circuit Court for the Northern District of Ohio. Certainly none has excited such diversity of criticism and speculation. The most judicious of the lawyers whose opinions have been sought for the enlightenment of the public, have confessed their inability to express an opinion on questions which involve so much that is new and suggestive. All are agreed that no exact precedent exists for an order of the character under view. But whether the principles of a Court of Equity can support this order, is the vital question upon which no one outside of the Ohio Court, the counsel before it and the parties interested, seems to have any decided conviction.

The order in question seems to have been one of those preliminary proceedings that Courts of Equity take in order so to preserve the *status quo* as to render its final mandate efficacious. Such an order is often hastily granted *ex parte* for the purpose of preventing an immediate threatened damage, with a reservation allowing the opposite party an early opportunity to question its correctness in a summary way and have it vacated, if its issue was erroneous. The present order in effect required the proper officers of the Brotherhood of Locomotive Engineers to revoke the rule prohibiting the handling of the Ann Arbor cars and to distribute, according to the methods of that Association, notice of such revocation. The production in court of the rule prohibiting such handling was likewise directed.

The sweeping character of this order is apparent at a glance. Its consequences are so far-reaching, if the Court had power to make it, that the mind becomes confused in the effort to adequately state them. It is comparatively immaterial in any given case, whether the particular order therein issued is subsequently upheld or vacated. The important question with which we have to deal is whether it lies in the power of the Court to make any such order at all, under any circumstances. If such power exists the question is then narrowed down to the comparatively simple and common one whether the circumstances of any special case justify the exercise of such power.

If there be no precedent for the issue of such order, as the lawyers agree, we have the one fact of novelty, which is *prima facie* unfavorable to the existence of such jurisdiction. But this is by no means conclusive, nor is it final, in any discussion of the length to which a Court of Equity may go. For there is no fact so well known in the history of such tribunals as the gradual evolution of their undefined powers in protecting their suitors from irreparable wrong. It is the boast of Equity, that it can and will prevent the perpetration of any wrong, preventable by human mandate, if a remedy exists in no other court. And it has repeatedly refused to define its jurisdiction for fear the limitation might shut out a case calling for its intervention. Its resources have been constantly exhibited in the protection of rights that had no existence in the dawn of Equity jurisdiction. The wonderful mechanism of modern life could not have been conceived even, much less specifically provided for, in the system of jurisprudence that antedated our epoch. And it was well agreed among the founders of this remarkable Court that its jurisdiction should be limited only by the efficacy of its mandate. Its principles have been illustrated in its history. For the Court is to day exercising powers that would have confounded the lawyers of the last generation. The rise of new relations and rights, with all their delicate interdependence and complications, gave an added value to this jurisdiction and rendered its exercise absolutely necessary if such rights and relations were to be protected at all. The Court aimed to be equal to the occasion and the law books of the last few decades disclose an advance of equitable intervention which in novelty and discrimination transcends anything before.

In the light of this record we are unable to discover on principle any reason why a Court of Equity should not intervene to protect its suitors from any disastrous and ruinous wrong, if its process is adequate for that purpose. The more powerful and unscrupulous the wrongdoer, the greater need for help. The more difficult to estimate the wrong, if accomplished, in dollars and cents, the more urgent the call upon the merciful intervention of the Court. The more irresponsible and pitiless the perpetrator, the greater reason for preventing the accomplishment of purposes which are not to be restrained in any other way. If it be once admitted that the locomotive engineers are about to inflict a grievous, irreparable wrong on the Toledo, Ann Arbor & North Michigan, or anybody else, it is apparent that they should be prevented if it can be done. This conclusion is neither unconstitutional nor immoral. And if the railroad is about to perpetrate an irreparable wrong upon the engineers it is equally just that the railroad should be prevented from so doing if possible. And we apprehend that the sole questions which a Court of Equity would raise on the threshold of such cases would be, not whether the Court had prevented the very thing before, but whether the wrong was irreparable and preventable.

Assuming that Judge Ricks is right in his conclusion that the case, as submitted to him, disclosed a wrong contemplated and in process of accomplishment, we have no reason to doubt that the refusal to handle its freight constituted an injury to the railroad for which there was no adequate redress in an action for damages or any other remedy than that of prevention. And whether this wrong was preventable seems to be answered in the affirmative by the reported effect of Judge Ricks' order. For Mr. Arthur and Mr. Sargent, according to the daily journals, state their intention to obey the order until it is vacated. This, of course, may be done by Judge Ricks himself on a more careful examination of the case or by the Appellate Court.

Whatever may become of this particular case or this particular order, it cannot fail to mark a very important period in railroad law. In the exercise of this novel jurisdiction, the Court has shown what it can do and what it will do. It does not promise unalloyed happiness and satisfaction to the railroad employer. It may sometimes prove the greatest blessing to the railroad employé. If this be the beginning of a new and efficacious proceeding by which the differences between the roads and their men can be authoritatively settled, and the settlement enforced, in the spirit of justice and good morals, neither side can reasonably complain. The public will be greatly benefited by relief from excessive inconvenience and loss on account of unreasonable controversies, for which it is in no degree responsible. And the world at large will be in every way better off in the preservation of those forces and supplies, the waste of which constitutes economically the greatest objection to causeless strikes.

Passenger Rates to the World's Fair.

The complaints of the newspapers of New York City and other places which were so general and so uniform last fall when the trunk lines decided to make no reduction in the rates to Chicago on fast trains and to reduce the fares only 20 per cent. on the 35-hour trains, seem to be as strong as ever. The arguments with which the railroads answered these complaints at that time appeared to fall on deaf ears, and so conservative a paper as *Harper's Weekly* has lately come out with an editorial presenting practically the same arguments that were made before. This editorial may be summarized in the claim that the railroads, being public servants and the only means by which the people of the country can go to Chicago and get the benefit of this great public enterprise, are bound to give the service and rates desired, even at a good deal of inconvenience; and, perhaps we may say, even at a loss. The same argument has been presented in other influential quarters. It is to be remembered, moreover, that this line of argument is not entirely without reason. There are numerous instances where a railroad, in order to perform its duty to the public, must give certain services for less than cost. The present question is whether this is an instance of that kind. The most common illustration of this phase of the matter is where a poor road, in a sparsely settled country, runs passenger trains at a loss because the towns have no other mode of conveyance, and the rail road, having been fostered by the towns, is bound to utilize its tracks and cars to furnish something like adequate facilities. But those who apply this reasoning to the case of the trunk lines should reflect that however simple and harmless this problem may appear on the surface, in point of fact the circumstances of these cases are generally of a desperate nature. Towns which thus have to ask a railroad to strain its resources for their benefit are really engaged in a hard struggle to save themselves from commercial death. Railroads which have not freight business enough to lead them to give reasonably liberal passenger service willingly are in a desperate case themselves. When we apply these considerations to the trunk lines, with their hundreds of millions of property interests, we encounter grave questions which cannot be settled in an hour, like the running of a single light passenger train or like a reduction in fares where the whole business is small.

As we said in our article of Nov. 25, we believe the

position of the railroads to be entirely reasonable. They took no action which would interfere with the freest cultivation of excursion business this summer, and there is no doubt that each road *will* thus stimulate its own passenger traffic to the extent of its facilities if the business does not offer without stimulation. The arguments which we stated in that editorial should be a full and convincing answer to the New York merchants and hotel-keepers, and others who take a strictly business view of the situation; but those who still think that the railroads ought to reduce fares for people of moderate circumstances, on the general ground of the duty of a common carrier to the public may perhaps deserve another word, and we ask their attention to a single paragraph.

It is a fact that the trunk lines make three-fourths of their income from freight business; that this freight movement is of vital importance to all the towns and cities of the country, and that to disturb it by taking the engines and men for numerous extra passenger trains would be a serious injury to these towns; and that the trunk lines are so crowded and their facilities in cars, engines and other appliances so fully taxed that a great increase of passenger business would disturb the freight, even if extra engines and men were available. It is also true that the railroads ought to spend hundreds of thousands of dollars for safety appliances and to carry out safety regulations before undertaking to greatly increase the number of passenger trains. We will, however, leave these matters out of the discussion. We will assume that the railroads are willing to carry passengers at a trifle above cost; that they will run the risk of derangement of their freight service, and that they will postpone the introduction of additional safety appliances until 1894 or later. We will set aside all these for the reason that one other element will settle the whole question. The critical point of the problem with each railroad manager comes when he has to consider his passenger equipment. To carry more passengers he must buy more cars. Let us take a hypothetical case. The Erie road is 986 miles long from New York to Chicago. Let us assume that in 1892 it carried 4,000 passengers (through) and received from them $64,000; profit $16,000. Let us assume that the company would be glad to carry 40,000 passengers this summer at half price, which would bring in $320,000; and that the net earnings on these would be $80,000. This estimate is doubtless too favorable to the public. It is not fair to assume that the percentage of expenses to earnings would be the same when passengers were carried at $8 as when carried at $16. It is universally admitted that the passenger business on our railroads does not bear enough of the general expenses and that the freight business bears too much, proportionately. But to carry these 36,000 passengers in six months would require, say, 50 new passenger cars, *beyond the ordinary increase*. This is a moderate estimate. Probably an additional 10-car train to Chicago would have to be run every day, and that would require five trains. To carry 36,000 passengers in six months it would be necessary to prepare for 250 to 300 a day, and it would not be safe to estimate over 250 or 300 passengers to the train. Now, these 50 cars would cost $250,000, and it is wholly within bounds to say that they would have to stand practically idle for one or two years after the fair was over. The bare interest on this investment is therefore, it will be seen, a considerable sum, and this, added to the deterioration by age, may fairly be assumed at from 12 to 15 per cent. a year, so that we have a loss of from $30,000 to $75,000, which must be taken out of the $80,000 profit (more or less) received from the summer's passengers. This is too narrow a margin to work upon, in business of such magnitude, except where the elements of uncertainty are few and small.

If any one thinks that the railroad managers are too conservative or selfish in looking at that $80,000 profit, and the liability of slipping up in trying to make it, let him consider the risk that has to be taken into account. To get 50 new cars the order would certainly have had to be given as early as January. In January—even now, for that matter—the making of a close estimate of the amount of traffic was an impossibility. A few cases of cholera might easily reduce the expected travel 50 per cent. A single train accident may easily cost more than the gross profit we have figured above; and in saying this we will consider only that class of accidents which, judging from the past, are to be regarded as more or less inevitable. The question of safety actually enters into the financial account at two points. First must be considered this question of looking out for losses when operations are conducted according to present standards, and, second, the expenditure of many thousands of dollars to secure a higher degree of safety in the future. This last point we will omit, as intimated above, but the other cannot be ignored.

Those who present the general argument of the duty of a railroad to the public are also bound to say *which* railroad shall serve them. There are eight or ten trunk lines from the Atlantic seaboard to Chicago. Which one of them will you compel to run a large financial risk in order to do its theoretical duty? How will you punish a manager who decides to let his competitor run the risks while he himself takes the sure business? People should also remember that the unanimity of the roads in their present attitude is not without its meaning. The considerations which have led the trunk lines for years past to make passenger rates to Chicago reasonably low—often unreasonably low—and to carry freight at *very* low rates, have the same effect in World Fair rates as in these other matters. That is, each road is working for itself, "first, last and all the time," and may be depended upon to reduce any and all rates, regular or excursion, whenever even a small profit can be made by so doing. Railroad managers who disdain openings for new business unless it promises large profits are not now in control of any of the trunk lines, however deceptive the appearances may be. If the World's Fair rate presented at the meeting of managers had been much too high, we may be sure that some road would have taken the public into its confidence and argued for a lower rate before this time.

Rapid Transit in New York.

In considering the rapid transit situation in New York City one may now start with the assumption that the subject divides itself into two parts; that is, that it may be considered with a view to getting the quickest possible relief from the present inadequate service, and secondly, with a view to establishing a system that shall be adequate for many years to come. Probably by this time most people have come to understand that the two main conditions are incompatible; that the final, comprehensive system canot be evolved and built soon enough to satisfy the very pressing call for immediate relief. This has long been understood by those who have studied the matter most carefully, as engineers or as investors, but it is only recently coming to be understood by many of the editors of the daily newspapers and by the great public. Engineers know very well that the fundamental plan of the future great and permanent system of rapid transit for the special case of the city of New York, is still a matter of discussion, and that the subject has by no means been so thrashed out that it is easy for a careful and thoroughly informed man to decide what it is best to do. They know also that the people of the city and state of New York are not yet ready to make such terms as will induce investors to put their money into this ultimate, great, rapid-transit railroad. The delusion still exists that the franchise for such a railroad is one of great value, and that somewhere in the world there is a body of "capitalists" who are eager to get hold of it. This delusion will only disappear by that costly and painful process which Disraeli once described as "to try, to fail, and to analyze our failures." So the preparation for the permanent and finally satisfactory rapid transit system of the city of New Yotk must be through a series of efforts to formulate it and failures to start it. Meantime, as the daily newspapers say, "something must be done," and it is a great thing to have got people to recognize the two divisions of the subject.

We may start now, therefore, with the assumption that the present business of the Rapid Transit Commissioners and of those who are responsible for pushing this matter is to evolve the best plan for getting improved service at once. Some two weeks ago the Commissioners adopted a plan which they offered to the Manhattan Company in lieu of the plan of extensions and increased facilities which that company last January asked permission to put into effect, and which was described, with a map, in the *Railroad Gazette*, Jan. 27. It will be remembered that the Manhattan Company asked substantially for one new line, most of the way with three tracks, from the Battery to Fort George, 11½ miles, in streets not now occupied; and for the privilege of laying more tracks on existing structures; and for a loop across the north end of the island, and another across the lower end through Canal street. Certain other privileges were asked for, but these were the essentials. The result, stated broadly, would have been six tracks on the west side all the way up to the Harlem, and eight tracks part of the way; and on the east side six tracks also from Chatham Square north. The possible accommodation would have been increased greatly, but not so much as it would seem on the face of the plan, because the terminals would still have been inadequate.

The plan lately acted on favorably by the Rapid Transit Commissioners rejects all of the new line in unoccupied streets except a cross-town line at the north end, and one to connect the Sixth and the Ninth avenue lines through Greenwich avenue, etc. It provides, however, for a new line south of the present junction of the Second and Third avenue lines. The Commissioners further authorize additional third tracks on existing lines, and stipulate that a third track shall be added on the south end of the Ninth avenue line, with the notion evidently that this will take the place of the rejected new line along West street. The Commissioners require also that the company shall acquire land for increased terminal facilities at the City Hall station and also at the upper ends of the east and west side lines.

It will be seen that the Commissioners' plan has this advantage over the one proposed by the Manhattan Company, that it gives up no new streets to that company, but leaves all territory now unoccupied still open for any new company that may stand ready to bring in an entirely new scheme. Of course this is an advantage; but the proposed plan has the immense disadvantage of doing very little in the way of relief for the traffic on the west side. It would improve matters a good deal on the east side, but on the west side the movement of trains is restricted, as we have repeatedly said, at certain congested points and by the capacity of the southern terminals, for which no provision is made. The Commissioners' plan also fails absolutely to offer any new advantages for a very important region and one that is fast filling up, in the northern part of the island. So while it should not be denounced as it has been by many of the daily newspapers, for it would really help matters very materially, still it does not go nearly far enough.

Mr. Samuel Spencer, one of the Commissioners, offered a substitute extending the west side lines to Fort George, and also from the present structures in Battery Place up West street, to join the Sixth Avenue line in Waverly Place. This would not only give an outlet for the people in the Fort George region, but would greatly increase the usefulness of the existing west side lines by enlarging their capacity at the south end, and it would further be a great convenience to a very large number of people who use the ferries along West street. Mr. Spencer's plan also provides that the new structures shall be capable of carrying four tracks.

Mr. Spencer also stipulates that the Manhattan company shall be required to convert the present Ninth Avenue structure between Cristopher and 109th streets into a four-track road, and that within three years of the completion of the Fort George extension the company shall construct a further extension to the northern limits of the city, and give fixed train service between those limits and South Ferry.

This seems to be a very judicious compromise between the plan of the Manhattan people and that of the Commissioners. It occupies about five miles less of new street than the Manhattan company proposes to use and so leaves the way open to future investors. On the other hand it is very much more of a present relief than that proposed by the Commissioners as a body. One point in Mr. Spencer's proposition is worth a moment's attention; that is, he provides that while the maximum rate of fare between any two points on Manhattan Island shall not exceed five cents, the maximum rate to any point within the city limits shall not exceed 10 cents. Doubtless the last provision will be strongly opposed, but, as we have often said, the public must face the fact that a passenger cannot be carried at a profit from South Ferry to Yonkers for five cents, and that all the additions which the Manhattan Railway Company proposes to make will cost a good deal of money, will add much to fixed charges and operating expenses and will add but little to net earnings for a good while. That company can get just as much out of a passenger who hangs on a strap as from one who sits on a seat, and the cost of providing straps is very much less than that of providing seats. There is no law to compel anybody to build railroads for the city of New York, and nobody is going to do so unless he can make money out of them, or thinks he can.

February Accidents.

Our record of train accidents in February, given in this number, includes 84 collisions, 117 derailments and 13 other accidents, a total of 214 accidents, in which 59 persons were killed and 303 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted except

where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

COLLISIONS:	Rear.	Butting.	Crossing and other.	Tot'l.
Trains breaking in two	5	0	0	5
Misplaced switch	0	2	4	6
Failure to give or observe signal	6	1	3	10
Mistake in giving or understanding orders	0	7	0	7
Miscellaneous	13	3	3	19
Unexplained	18	13	6	37
Total	42	26	16	84

DERAILMENTS:			
Broken rail	18	Bad switching	1
Loose or spread rail	11	Bad loading	1
Defective switch	3	Animals on track	0
Defective frog	1	Landslide	2
Broken wheel	4	Avalanche	2
Broken axle	2	Snow or ice	8
Broken truck	2	Malicious obstruction	2
Fallen brakebeam	1	Accidental obstruction	1
Broken brake chain	1	Unexplained	53
Misplaced switch	3		117
Too sudden application of air brakes	1		

OTHER ACCIDENTS:	
Boiler explosion	2
Broken side rod	3
Cars burned while running	2
Various breakages of rolling stock	3
Other causes	3
	13
Total number of accidents	214

A general classification shows:

	Collisions.	Derailments.	Other acc'd'ts.	Total.	P.c.
Defects of road	0	33	0	33	15
Defects of equipment	5	10	8	23	11
Negligence in operating	42	6	2	50	23
Unforeseen obstructions	0	15	3	18	8
Unexplained	37	53	0	90	43
Total	84	117	13	214	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other acc'd'ts.	Total.
Passenger	29	47	7	83
Freight and other	127	71	6	204
Total	156	118	13	287

The casualties may be divided as follows:

	Collisions.	Derailments.	Other accidents.	Total.
KILLED:				
Employés	32	12	1	45
Passengers	9	3	0	12
Others	1	1	0	2
Total	42	16	1	59
INJURED:				
Employés	66	56	5	127
Passengers	47	118	7	172
Others	1	3	0	4
Total	114	177	12	303

The casualties to passengers and employés, when divided according to classes of causes, appear as follows:

	Pass. killed.	Pass. injured.	Emp. killed.	Emp. injured.
Defects of road	2	71	1	28
Defects of equipment	0	17	1	6
Negligence in operating	9	47	32	67
Unforeseen obstructions and maliciousness	0	15	5	10
Unexplained	1	22	6	16
Total	12	172	45	127

Thirty seven accidents caused the death of one or more persons each, and 51 caused injury, but not death, leaving 126 (59 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with February of the previous five years shows:

	1893.	1892.	1891.	1890.	1889.	1888.
Collisions	84	85	93	64	51	57
Derailments	117	115	93	55	61	104
Other accidents	13	12	10	9	5	13
Total "	214	212	196	128	117	174
Employés killed	45	37	52	50	29	21
Others "	14	7	9	3	3	7
Employés injured	127	55	161	111	39	99
Others "	176	48	114	69	49	65
Passenger trains involved	83	79	85	44	32	70

Average per day:

	1893.	1892.	1891.	1890.	1889.	1888.
Accidents	7.64	7.31	7.00	4.57	4.21	5.93
Killed	2.11	1.52	2.18	1.89	0.82	0.97
Injured	10.82	3.55	9.82	6.42	3.14	5.66

Average per accident:

Killed	0.276	0.208	0.311	0.414	0.195	0.132
Injured	1.416	0.486	1.403	1.406	0.752	0.953

It is common knowledge that we have had nearly everywhere in this country a hard winter, harder, in a large territory, than for several years. The accident record for February hardly shows evidence of this, for the number of accidents and the number of persons killed are not greatly different from last year, but the number of persons injured is three times as large as a year ago; and as 99 of these injured are classed under the head of "Defects of road" we cannot say that the weather has not had its influence. But each observer can decide for himself whether to compare the record with 1892 and say that the accidents have been much worse this year, or to compare with 1891 and conclude that by means of stronger cars and better care on the part of officers and trainmen we have weathered a much harder winter with no marked increase in the injuries. As we have often remarked before, the records of the number of persons injured must never be used for making close comparisons.

The records show that 12 passengers were killed in February. Three of these passengers were riding in freight trains. The passenger train accidents under this head were at Old's Ferry, Idaho, on the 5th; Atlanta Junction, Ga., on the 11th; Palmyra, N. Y., on the 21st; Columbia City, Ind., on the 22d; and West Philadelphia, Pa., on the 22d. The last was the most serious, and a somewhat remarkable case and we have discussed it in another column.

There were two bad locomotive explosions in February which do not go into the train accident record, though the engines were just ready to take out trains. One was on the Tyler Southeastern road, at Tyler, Tex., on the 8th, where one man was killed and two injured; the other was on the Texas & Pacific, at Fort Worth, Tex., on the 19th, where one man was killed and five injured.

Three persons were killed and 25 injured at Portland, Or., on the 15th in an electric street car which became uncontrollable on a steep grade. A similar accident in Williamsburgh, N. Y., on the 6th resulted in the injury of several passengers. Street cars were struck by locomotives at Allentown, Pa.; Albany, N. Y.; Salem, Mass.; Camden, N. J.; and Jersey City, N. J., in February. In the first three cases the cars were propelled by electricity. About a dozen people were injured, altogether, in these five cases. The Allentown case is the only one in which fault is attributed to the electric appliances. In that case the trolley pole is said to have jumped the wire while the car was crossing the tracks of the Central Railroad of New Jersey. Five persons were reported injured by a smash-up on the incline cable road, near the Union station, at Kansas City, the cable having broken. At Syracuse, N. Y., on the 4th, five trackmen on the New York Central were struck by a train and killed. They were walking to their work; the weather was very cold and the wind was blowing furiously.

The office of Chief of Motive Power, which has just been created by the Pennsylvania Railroad Company, and to which Mr. T. N. Ely has been promoted is, so far as we know, unique. We believe that no other railroad in the world has a similar office. The incumbent is relieved from the details of administration, such as passing on requisitions, dealing with employés, and a million other small but important facts with which the Superintendent of Motive Power must consume nine-tenths of his time, and is left free to consider only the larger questions of his department. He has final authority over standards of construction and practice for the whole system. In short his functions are analogous to those performed by a Vice-President. Such a position, on so large a system, occupied by a man who has been trained by years of administrative work, may be made very important and useful. Occupied by another man it would probably be rather ornamental than otherwise. But there is no department of railroading in which such economies can be made, that is after a railroad is constructed, as in the motive power department. An office like that now created on the Pennsylvania, filled by a man of ripe powers and comprehensive intelligence, will undoubtedly produce very valuable results in the science and art of railroading; results which will be valuable not only to that system but to the world.

It is in pleasing contrast to some cases of the kind to find that the engineman in a crossing collision, reported in another column, was governed wholly by the signal, and not by what he saw of the movements of the other train. We do not know but he would have taken more effective measures if he had seen that train, but so many men look at (or for) trains, instead of at the signals, to the great impairment of discipline, that this instance is worth noticing. In the long run the engineman who "gives her sand" just as vigorously when there is no train on the crossing as when he actually sees danger is the safer man to have.

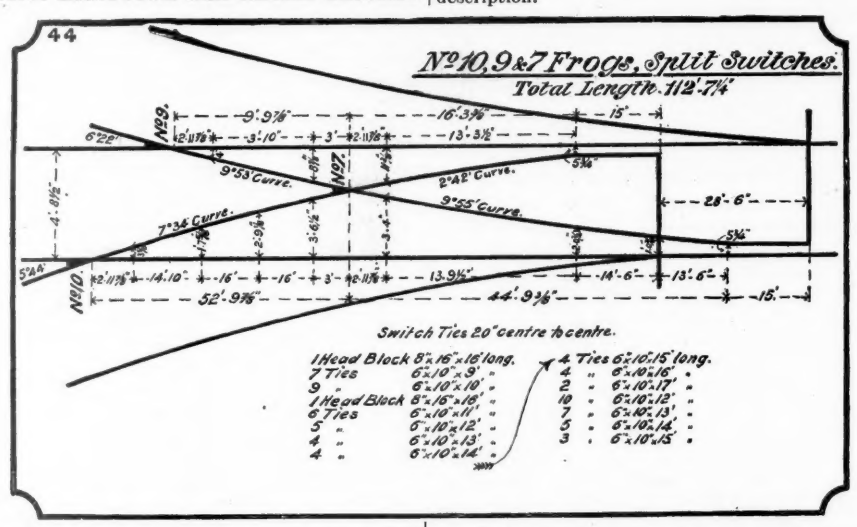
NEW PUBLICATIONS.

Switch Layouts and Curve Easements. By Augustus Torrey, Principal Assistant Engineer Michigan Central Railroad. New York: The *Railroad Gazette*. Price, $1.

This is a pocket-book for the track foreman, supervisor and assistant engineer; convenient in size, plain and clear in execution, and containing something more than one hundred diagrams of layouts, carefully figured, applicable to almost any conceivable combination of turnouts which can occur upon a railroad. The puzzling or laborious calculations, which most of the manuals require, have here been made; the only figures the foreman will need to use, with these diagrams, are those upon his tapeline, and those only for measuring, not for mathematical computations. Even to the accomplished graduate of the technical schools it will be a relief, especially upon a blustering wintry day, to find by simple inspection one of these diagrams which fits the case before him so exactly that he only needs to copy it upon a fly leaf, and handing it to Pat or to Mike to carry out he may betake himself to a warm place and something hot.

Mr. Torrey has had this advantage over his predecessors in the determination of leads, that practice has now become nearly fixed and "standard." In some of the older books the switch rail has been assumed to be movable, even for a length of 34 ft., and to take of itself the curvature which the writer's solution of the turnout problem required; the wing rails of the frog have also been supposed to share in this mobility and to form a part of the curve. On the contrary, Mr. Torrey has taken the facts as he finds them to-day; that the wing-rails are fixed and straight, on the turnout side of the frog, for a length of 3 ft., and that the split-switch-rail is 15 ft. long. Of course, his leads must differ considerably from the old tables, but only so far as they are nearer to the "exact truth;" for it must be admitted that as to turnouts and cross-overs truth is comparative, and that the locomotive will never discover any moderate variation from the most refined exactness, when traversing the curve.

Another peculiar merit of this book deserves mention as enhancing its labor-saving characteristic; each diagram is accompanied by a specification of the number and dimensions of timbers required for laying the turnouts in the best manner. The subjoined copy of one of the diagrams will give a better idea of the value of the manual to the every-day trackman than would pages of description.



These diagrams have been subjected to the test of practical use on the Michigan Central Railroad, where Mr. Torrey has had an opportunity to experiment with them upon the minds of ordinary trackmen; and the result has demonstrated their great value in securing uniformly good work upon the whole road; it may be remarked, however, that the Michigan Central Railroad uses as standards only the odd numbered frogs and split-switches, whereas these diagrams and tables include the use of both odd and even numbered frogs and both split and stub switches.

Curve easements, upon many different theories with one purpose, have occupied the minds of careful trackmen more and more of late, as high speeds have become more common and illustrated the need of giving the truck time to turn gently into a new direction, instead of all at once, as it must at the P. C. of an uncompounded or uneased curve. Mr. Torrey has constructed a series of tables illustrated by diagrams, which afford to one who will patiently study them an extended series of easements adaptable to any possible case. Mr. Torrey has not supposed that these easement tables would be useful to ordinary foremen; but they are quite understandable by them, if only they would be willing to take the trouble necessary to their being comprehended. Although these tables do not increase the bulk of the book enough to make its dimensions objectionable, there will probably be a demand for an edition of the "Switch Layouts" alone, on the part of trackmen, who do not care to undertake "curve easements;" leaving the consideration of such high topics to the Assistant Engineers, to whom this volume as it is, offers itself, in the language of the Romans, as a *vade mecum* of great convenience and value.

Old Railroad Literature.—In our issue of Feb. 24 there appeared a notice of a catalogue of old and rare railroad books, journals and periodicals for sale by Mr. Edward Baker, 14 and 16 John Bright street, Birmingham, England. Mr. Baker informs us that he has in preparation now a catalogue at least twice as large as the one that we noticed before, which covers many extraordinary and curious articles on the "railway mania," early tickets, guides, original prospectuses and numerous

other items. He will be glad to receive names and addresses to which to send copies of this catalogue, which will be ready soon after Easter.

The Handy Sketching Book for Engineers and Draughtsmen. New York: Spon & Chamberlain. 1893. Price, 25 cents.

This is a book of sheets 5 × 8 in., ruled to eighths of an inch, designed as its title suggests, for convenient sketching to scale.

Train Accidents in the United States in February.

DERAILMENTS.

DEFECTS OF ROAD.

(*Continued from page 227.*)

11th, on Atchison, Topeka & Santa Fe, at Baring, Mo., a passenger train was derailed by a broken rail and ran some distance on the sleepers to a trestle where the ties being bunched, two passenger cars fell, with a part of the trestle to the ground some 40 ft. below. There were but a few passengers in the train, and only 1 of them seems to have been seriously injured.

15th, on Great Northern, near Bartlett, N. D., an east bound passenger train, drawn by two engines, was derailed and ditched by a broken rail. A sleeping car was overturned and the other cars badly damaged. There were 26 passengers on the train, of whom 9 were injured.

16th, on Atchison, Topeka & Santa Fe, near Rutledge, Mo., 1 car of a passenger train was derailed by a broken rail and fell down a bank, being badly wrecked. The conductor and 2 passengers were injured.

19th, 11 p. m., on New York, Lake Erie & Western, near Mast Hope, N. Y., two sleeping cars and a private car on the rear of a west bound passenger train were derailed by a broken rail and fell down a bank. Four trainmen and 2 passengers were injured.

21st, on West Shore road, near Palmyra, N. Y., west bound express train No. 7 was derailed, and after running some distance on the ties the cars fell down a bank. There were 2 engines on the train, and 1 of them was overturned. One passenger was killed and 7 passengers and 6 trainmen injured. It is said that a car in a freight train had jumped the track and loosened the rails a short time before. The freight car had been re-railed at a bridge and the derailment had therefore been undiscovered.

22d, 1 p. m., on Pittsburgh, Fort Wayne & Chicago, near Columbia City, Ind., 2 cars of a passenger train were derailed by a broken rail and fell down a bank. One passenger was killed and 28 passengers and 3 trainmen injured.

25th, on New York, Ontario & Western, near Valley Mills, N. Y., 2 cars of a passenger train were derailed and fell down a high bank. Several pussengers were injured. It is said that the rails spread.

25th, on New York, Lake Erie & Western, near Vandalia, N. Y., passenger train No. 8 was derailed while running at considerable speed, 3 sleeping cars falling down a bank. It is said that the rails spread. Three trainmen and 8 passengers were injured.

26th, on Cumberland Valley Road, near Cleversburg, Pa., a freight train was derailed by a broken rail and 8 cars wrecked. One brakeman was injured.

26th, on New York Central & Hudson River, near Oriskany, N. Y., a freight train was derailed by a broken rail and 18 cars were wrecked. It is said that the conductor of the preceding freight had discovered the breakage of the rail but neglected to send back a flag.

And 16 others on 12 roads, involving 4 passenger and 12 freight and other trains.

DEFECTS OF EQUIPMENT.

5th, on Cleveland, Cincinnati, Chicago & St. Louis, near Fairland, Mich., a freight train was derailed by the breaking of a wheel and the caboose and 1 car fell down a bank; both were burned up. The conductor and 4 passengers were injured.

8th, on Lehigh Valley, near Rahway, N. J., 4 cars in a freight train which was switching became uncontrollable in consequence of the failure of a brake chain, and ran off the track and through a brick shop, doing several thousand dollars damage. One man in the shop was fatally injured and 2 others less severely.

9th, on New York & New England, at Cheshire, Conn., a freight train was derailed by a broken journal and 4 cars were wrecked. A brakeman was injured.

20th, on Texas & Pacific, near Mineola, Tex., passenger train No. 2 was derailed and 6 cars overturned. Two of the passenger cars fell into Sabine Creek and 2 passengers were nearly drowned; 13 passengers were injured. It is said that the derailment was caused by a broken truck under the tender.

And 6 others on 6 roads, involving 2 passenger and 4 freight and other trains.

NEGLIGENCE IN OPERATING.

25th, on Concord & Montreal, at East Manchester, N. H., a freight train was derailed at a misplaced switch, and the engine badly damaged. A brakeman was injured.

And 5 others on 5 roads, involving 2 passenger and 3 freight and other trains.

UNFORESEEN OBSTRUCTIONS.

1st, on Denver & Rio Grande, near Toltec Tunnel, Col., a passenger train was struck by a snow slide, all the car behind the baggage cars being thrown down a bank about 150 ft. One of the brakemen and 7 passengers were injured.

2d, on Chicago, Milwaukee & St. Paul, near Worthington, Ia., a passenger train was derailed in a snowbank, and the passenger car was ditched; conductor and 1 passenger injured.

6th, on Chicago, Milwaukee & St. Paul, near Sheldon, N. D., the tender of an engine pushing a snow plow was derailed, together with the caboose next behind it. The caboose fell down a bank and took fire from the stove. The conductor and 1 brakeman were burned to death.

9th, on Baltimore & Ohio, near Toll Gate, W. Va., a freight train was derailed by a landslide and the engine and 10 cars wrecked. The engineer was killed and 2 other trainmen injured.

10th, on Union Pacific, near Frisco, Col., a train consisting of two engines, rotary snow plow and caboose was pushed down a bank and wrecked by an avalanche of snow. The engineer and fireman of the rotary were killed and 4 other employés were injured.

12th, on Southern Pacific, near Delta, Cal., a freight train was derailed and overturned by a rock which had fallen upon the track. A brakeman was injured.

24th, on Chicago & Western Indiana, at 16th street, Chicago, a passenger train was maliciously derailed, supposably by switch tenders who had left the road in a strike.

And 8 others on 7 roads, involving 6 passenger and 2 freight trains.

UNEXPLAINED.

5th, on Union Pacific, near Old's Ferry, Idaho, a passenger train was derailed on a curve and 2 cars over turned. One passenger was killed and 17 injured. It is said that the train was running rapidly. The stove in the baggage car was wrecked, but the car fell into the Snake River, extinguishing the fire.

6th, on Baltimore & Ohio, near Parkersburgh, W. Va., an east bound passenger train was derailed in a tunnel; it was running at considerable speed, and the cars ran some distance rubbing against the sides of the tunnel. The engineer and fireman were injured.

7th, on Norfolk & Western, near Suffolk, Va., a passenger train was derailed and 1 car overturned. Several passengers were injured.

9th, on Central Vermont, near Braintree, Vt., a freight train was derailed and 17 cars overturned. The engineer was injured.

9th, on Old Colony road, near Neponset, Mass., a freight train was derailed and 1 brakeman killed.

13th, on New York, Chicago & St. Louis, near Girard, Pa., a freight train was derailed and the engine was wrecked. Four trainmen were injured, 2 of them, it is said, fatally.

13th, on South Atlantic & Ohio, at Horton Summit, Va., a freight train was derailed and most of it fell down a bank about 100 ft. The engineer was killed and 2 other employés injured.

13th, on Norfolk & Western, at Seven Mile Ford, Va., a freight train was derailed and fell down a high bank. The engineer, fireman and 1 brakeman were injured.

18th, on Philadelphia & Reading, at Fern Rock, Pa., several cars in a freight train were derailed and thrown against a flagman's cabin, injuring the flagman.

20th, on Prospect Park & Coney Island, near Coney Island, N. Y., the engine of a passenger train was derailed and the engineer injured.

20th, on Illinois Central, near Lena, Ill., a freight train was derailed and 2 cars, containing 42 valuable horses, fell down a bank. Twenty-five horses were killed.

23d, on Boston & Maine, near Kennebunk, Me., a passenger train was derailed and badly wrecked, several cars being overturned. Two mail agents were injured, 1 fatally, and 2 trainmen and 2 passengers were also hurt.

23d, on Central Vermont, near Ludlow, Vt., a snow plow was derailed and, with one of the engines, fell down a bank. A section master was killed and a road-master injured.

28th, on New York Central & Hudson River, in New York City, an empty engine was derailed and a boy stealing a ride was injured.

And 39 others on 35 roads, involving 10 passenger and 30 freight and other trains.

OTHER ACCIDENTS.

1st, on Philadelphia & Reading, near Bridgeport, Pa., the engine of a freight train was wrecked by the explosion of its boiler. The engineer and fireman were stunned; 2 other men on the engine escaped unhurt.

5th, on Burlington & Missouri River, near Brush, Col., the engine of a freight train was disabled by the breaking of a driving axle, one of the wheels coming off. The engineer was injured.

22d, on Port Jervis, Monticello & New York, near Port Jervis, N. Y., the cab of the locomotive of a passenger train was wrecked by a snow drift and the engineer was injured.

25th, on Toledo, Ann Arbor & North Michigan, near Cadillac, Mich., the locomotive of a freight train was wrecked by the explosion of its boiler. The fireman was killed.

25th, on New York Central & Hudson River, near Crittenden, N. Y., the engine of the Empire state express was badly damaged by the breaking of a parallel rod; the fireman was injured.

27th, on Kentucky Central, at Talbott, N. Y., the smoking car of a passenger train was burned up, and 7 passengers injured by flames which are said to have started from a can of gasoline carried by a passenger. According to the reports the news boy carelessly ignited the fluid when he lighted a cigarette.

And 7 others on 6 roads, involving 4 passenger and 3 freight and other trains.

A summary will be found on another page.

TECHNICAL.

Manufacturing and Business.

The Pulsometer Steam Pump Company, of 120 Liberty street, New York, reports a recent shipment in one day of 32 pumps, several of them being of the largest sizes made by the company. An illustrated circular is being prepared describing pump machinery, particularly adapted to railroad work, and will be published shortly.

Pantasote leather, which is a substitute for leather in passenger car upholstery, has been ordered by the New York Central & Hudson River road for six of its new passenger cars, and many of the large railroad companies have given sample orders for the leather. It is controlled by Clarence Whitman & Co., 39 Leonard street, New York.

Among other contracts recently made for the Buckeye automatic car coupler is one for 1,500 cars being built for the Columbus, Hocking Valley & Toledo by the Michigan Peninsular Car Company of Detroit.

The Chicago Electric Headlight Co., of Chicago, with a capital stock of $200,000, has been incorporated in Illinois. The incorporators are John T. Van Smith, Arthur Horton and Clarendo B. Eyer.

The American Bridge Works, of Chicago, has filed the required notice of the increase of its capital stock from $100,000 to $200,000.

The Victor Stock Car Co., of Chicago, has been incorporated with a capital stock of $100,000. The incorporators are J. L. McKittrick, E. D. Northam and R. J. Campbell.

Minority stockholders in the Atlanta Car Works, owning stock to the value of $34,000 out of a total stock of $72,000, have filed a petition for a receiver. They object to various specified acts of T. G. Healey and C. E. Healey, and the other majority stockholders. The works have not been in operation for two years.

The name of "The Congdon Brake Shoe Company" has been changed to "The Sargent Company," as already announced, and the business established under the former name in 1876, confined at first to the introduction of the Congdon brake shoe, and developed since into a general brake shoe, iron and steel castings business, will hereafter be carried on under the latter name. This change in the name does not imply any change in policy or ownership, but has been rendered advisable by the expansion of the business. The company now does a large business in steel castings for railroad companies and manufacturers, in addition to the brake shoe business which kept the iron foundry up to its full capacity for the last year and rendered necessary the introduction of improved methods, giving a larger capacity. The successful venture of the company in steel castings has been an important advance in railroad and industrial practice and the company's enterprise deserves the success which it has commanded.

Iron and Steel.

The Pennsylvania Steel Co. is making fair progress on the new open-hearth plant which it is erecting at Steelton, despite the unfavorable weather. The plant will embrace six 35-ton tilting open-hearth furnaces, placed in two rows facing one another. One of the furnaces is approaching completion, while the others are in different stages of advancement.

Plans for the consolidation of the Ætna Iron & Steel Co. and the Standard Iron Co., whose plants adjoin each other at Bridgeport, Ohio, and which are controlled very largely by the same people, have been consummated, and now require only a formal vote of the stockholders. The name of the new company will be The Ætna-Standard Iron & Steel Co., capital, $2,300,000, divided into $1,500,000 shares of preferred stock with 8 per cent. guaranteed and $800,000 common stock; $1,200,000 of the preferred and $800,000 of the common stock will be issued in payment for the two plants, and $300,000 held for improvements. A new Bessemer steel plant to supply the two finishing mills will be erected. The two mills have a capacity for turning out nearly 40,000 tons of finished sheet, galvanized, bar, rod, skelp and rails a year.

A syndicate organized in Boston, Mass., is reported to have secured an option on the rolling mills at St. Johns, N. B., and also, it is reported, on the steel plants at New Glasgow and other points in Nova Scotia.

New Stations and Shops.

The town of Moncton, N. B., is making an effort to have the shops of the James Harris & Co., of St. John, N. B., recently burned, rebuilt in that city. It is stated that the firm is willing to locate in Moncton in case $50,000 is subscribed in stock. Mayor Summer is soliciting stock subscriptions, and the council has resolved to grant 10 years' exemption from taxation.

Large Steel Gear Wheels.

The Midvale Steel Co. has just made two very large gear wheels for the Denver City Railway Cable Co. Each gear wheel is made in four pieces, being divided on the width of the teeth and on the diameter, the dimensions being as follows:

	Main gear. Lbs.	Pinion. Lbs.
Weight, each piece	15,250	10,500
" whole wheel	61,000	42,000
Pitch, diameter	12 ft. 9⅝ in.	9 ft. 3⅜ in.
Width, face	3 ft. 4 in.	3 ft. 4 in.
No. teeth	80	58

Track Tanks on the Lake Shore.

It is announced that the Lake Shore & Michigan Southern will at once coustruct track tanks at three or four points on the main line, thus enabling the company to run trains through between Buffalo and Chicago with only three stops.

Interlocking.

The New York State Railroad Commission has conditionally approved of the Philadelphia & Reading's interlocking system at Van Etten Junction, Chemung County (on the Lehigh Valley). The board requires that the distant signal be set 300 ft. farther back than proposed in the plans submitted, making it 1,500 ft. from the crossing.

The Illinois Railroad and Warehouse Commission has ordered interlocking put in at the crossing of the Indiana, Illinois & Iowa with the Chicago & Eastern Illinois at Momence.

The Johnson Railroad Signal Company has just closed a contract with the Chicago & Northern Pacific for an interlocking plant at Harvey, Ill., at the crossing of the Chicago Central, Chicago & Grand Trunk and Illinois Central railroads, with fifty working levers.

New Ore Dock at Duluth.

The Duluth, Mesaba & Northern announces that the road will build a duplicate of the ore dock now under construction at Grassy Point, on St. Louis Bay, near Duluth. It will be built parallel to the first dock, o the same capacity, and will be 2,370 ft. in length.

Car Lighting.

The Pintsch system of car lighting is to be applied on the Pullman cars running on the Atchison, Topeka & Santa Fe.

The Pintsch system has also been adopted for the cars of the Broadway Cable Railroad, in New York City. As the Manhattan Elevated will have to compete with this railroad for short distance traffic, this will perhaps be another inducement for that company to improve its method of lighting.

A New Wood for Car Sills.

The Wason Manufacturing Company is using Oregon or Douglass pine for the longitudinal sills of passenger

cars in place of Southern yellow pine. It is claimed that the Douglass pine is about one-fourth lighter and is stronger than Southern pine and handsome lumber in every respect. It is probably the first ever used in the New England states for car sills, but has been used for many years by the Southern Pacific and other roads on the Pacific slope, and has been very favorably reported on as to strength and available size by Navy Yard officers and others. The cargo in question was brought round Cape Horn by a sailing vessel.

To Car Coupler Makers.

A committee appointed by the Master Car Builders' Association has obtained permission to make tensile tests of automatic couplers at the Watertown Arsenal in Massachusetts. Drop tests will be made at Altoona, Pa. The committee therefore requests that owners of couplers of the M. C. B. type who desire to have their product tested by this committee should deliver free of charge eight couplers at Watertown Arsenal and four couplers at Altoona, Pa., as soon as possible.

The couplers sent to Watertown Arsenal should be shipped to the "Commanding Officer, Watertown Arsenal, Boston, Mass.," and the couplers sent to Altoona, Pa., should be shipped to J. M. Wallis, Altoona, Pa.; each coupler to be complete and ready for service, and to be marked for identification. Communications in respect to the tests and advices of all shipments should be addressed to J. M. Wallis, Supt. M. P., Penn. R. R. Co., Altoona, Pa.

THE SCRAP HEAP.

Notes.

The Baltimore & Ohio has reduced the forces at a number of its shops.

The yardmen of the Big Four at Springfield, O., struck on March 19, the alleged grievance being the failure of the road to take back men who struck two weeks ago. The strikers gave in, however, on the 20th.

A Georgia paper says that the Georgia, Southern & Florida raises tobacco on a 40-acre field at Cycloneta, Ga., and sells it at a good profit. It appears that this is an experiment to show what can be done in tobacco raising in Georgia.

Messrs. W. D. Vincent and John Hall, recently elected Railroad Commissioners of Kansas, have instituted proceedings in the Supreme Court to oust Commissioners Anthony and Mitchell, who hold on to their offices.

It is reported that the principal railroads of Kentucky, Tennessee, Alabama, Georgia, Mississippi and Florida contemplate the establishment of a committee of presidents to fix rates of wages for employés, which it is intended to apply uniformly on all the roads.

At Bridgeport, Pa., on the night of March 14, miscreants extinguished and broke 18 switch lamps and pulled out 12 coupling pins in a freight train. Switches had also been misplaced and it is supposed that train wrecking was intended. One arrest has been made.

A Western paper states that the Wabash road has recently re-established telegraph offices at certain small stations where they had been closed because the agent at one of them failed to get some shipments of live stock, owing to his inability to order cars by telegraph. The animals were driven several miles to a competing road.

A despatch from Jellico, Tenn., March 18, reported that four desperadoes took possession of a Louisville & Nashville passenger train and that the conductor, aided by a sheriff who happened to be on the train, had a hot fight with them. The sheriff was killed and his deputy injured. Two of the ruffians were fatally injured.

The Nashville *Banner* states that the railroads centering in that city have agreed to form a terminal company, to build a new union passenger station. The project has been under consideration for several years, and it is now said that arrangements are practically completed. The proposed station will front 149 ft. on Broad street and extend back 164 ft.

The Secretary of Internal Affairs of Pennsylvania has issued a report of the casualties on railroads in that state during 1892. His figures are as follows:

	Killed.	Injured.
Passengers	42	658
Employés	495	6,833
Other persons	952	1,329
Total	1,489	8,820

Applications of enginemen on the Atchison, Topeka & Santa Fe, and of conductors and brakemen on the Chicago & Grand Trunk for an increase of pay, which were presented last week, were referred to the Chicago General Managers' Association. It seems that the agreement on which this association is based, which was noticed in the *Railroad Gazette* of last week, stipulates that all cases of this kind shall be referred to the association.

World's Fair Notes.

The Barre Sliding Railway Company, whose exhibit was to have been a feature of the exhibit on Midway Plaisance, has failed to complete its road, and as the managers admit that they cannot raise money to do so, their concession has been forfeited.

Among the late arrivals in the Department of Transportation is the exhibit of the Canadian Pacific Railway, consisting of a ten wheel passenger engine, baggage car, second-class coach, first-class coach, diner, and sleeping car. The entire train was built in the Montreal shops of the Company and makes a very attractive exhibit.

Around the lofty roof of the Manufacturers' Building there is to be a promenade for visitors. An unsurpassed view of the grounds and buildings will be afforded and it will probably be the most extensive lofty promenade in the world. The altitude of the walk is to be 250 feet. The Hale Elevator Company has been awarded the contract for four elevators to run to the roof, and a fee will be charged for the ride.

Other exhibits lately received are the London & Northwestern locomotive, "Queen Empress" the "Sampson," built in 1838 by Timothy Hackworth, and brought to America the same year for use in a coal mine in Nova Scotia, and the "Albion," another locomotive from Nova Scotia, built in 1840. The passenger coach hauled by the "Sampson" and capable of seating four persons has also arrived.

The North German Lloyd Steamship Company, the largest steamship company in the world, is preparing an elaborate exhibit for the World's Fair in Chicago, and will have a pavilion in the middle of which there will be a large map of the world on which the daily positions of all of the steamers of the company on its various lines will be represented by minature steamers that will be moved from day to day to correspond with the movements of the steamers all over the world. Around this large map of the world will be placed the six models of the newest North German Lloyd steamers, the "Havel," running between Bremen and New York; the "Kaiser Wilhelm II.," running between New York and Genoa; the "Meier," running between Bremen and Baltimore; the "Karlsruhe," running between Bremen and Australia, and the model of the new twin screw steamer now building for the line between Bremen and the River Plate, and Bremen and China.

Foreign Notes.

The growing application of the trolley system of electric street car traction abroad as well as in the United States is well shown by the frequent references of foreign journals to new lines established at different places. One of the latest installations is that for the line connecting Lyons and Oullins, in France, and hitherto operated by horse power. The Thomson-Houston system is to be there employed, and McIntosh & Seymour engines will be used, so that the outfit will be essentially American in type. The line is six kilometres long, and is operated by the Compagnie des Omnibus et Tramways.

Work in Chicago.

As a result of the extensive building operations in Chicago, railroads and manufactures generally find much difficulty in hiring first-class mechanics. The building trade is kept busy on the many new buildings now rushing to completion for World's Fair attractions or for the accommodation of visitors to the Fair, and mechanics of all kinds find ready employment in the Exposition buildings installing exhibits. So scarce are pattern makers that the Grant Locomotive Works has been compelled to have many of its patterns made at outside shops, being unable to find unemployed pattern makers in the city.

New Orleans Traffic from South America.

The Illinois Central has for some time been endeavoring to secure modifications of the quarantine system which will permit travel through New Orleans during the World's Fair season, and give the road a share of the business from South and Central America. Under the strict quarantine system three days' detention at the mouth of the river is required, and that would virtually give to New York a monopoly of the business. The health authorities are satisfied that modifications can safely be made, and a meeting of the Board of Health will be held in about a week to pass on the matter officially. It is proposed to have physicians appointed by the Board of Health stationed in every large port in the countries named, and the passengers will be required to be under their supervision for ten days before their departure. A certificate from the physician to that effect will be a passport through the lines, and the detention at the quarantine station will only amount to a few hours until the baggage is disinfected. As soon as the board takes official action the passenger service will be organized and a large number of visitors are expected to take this route to the Fair.

Calumet & Chicago Canal & Dock Co.

The President of the Calumet & Chicago Canal & Dock Company has prepared his annual report for the stockholders. It appears that the land sales for the year 1892 were not so large as in 1891. They were $187,333, against $423,655 in the previous year. The falling off is attributed to the general dullness that has prevailed in the real estate market. Prices, however, did not decline, and the smaller sales, in the opinion of the President, should not cause stockholders any special disappointment, since for the property sold there was realized $37,714 more than the valuation placed upon it by the company. President Otis is very hopeful for the future. Business in South Chicago is good, and promises to continue so. The various industries are in full operation and wage earners have constant employment, the pay roll of one concern there amounting to $2,750,000 for the year. Since 1872 the sales of real estate have amounted to $5,269,527, the largest sales for any year being in 1890, when they amounted to $1,200,511. The cash receipts for the year were $484,689, and the disbursements $424,171, leaving a cash balance in the hands of the treasurer of $60,518. The resources of the company Jan. 31 are placed at $4,554,710. The outstanding capital stock amounts to $3,569,650, leaving a surplus on hand of $985,060. Real estate sold during the year consisted of 1.36 acres, 92 lots and 848 ft. of dock property. Property remaining unsold consists of 3,535 lots, 2,197 acres and 4,209 front feet of dock property.

The Elizabeth Grade Crossings.

During the past week the work on the Pennsylvania Elevated Road at Elizabeth, N. J., has progressed rapidly. The excavation to depress Rahway avenue is down to grade on the east side of the tracks and the temporary trestle to bridge the gap is being prepared. At the Broad street crossing, the two foundations are finished up to the line of the neat work, for the width of the two east tracks. The ironwork for the bridges over the Broad street-Morris avenue crossing is all on the ground and will be put in place as soon as the trestles are up.

Elevated Roads in Chicago.

A number of West Side property owners in Chicago have renewed their efforts to hinder the construction of the Lake Street Elevated road. The attack comes in the form of a supplemental bill which has been filed to restrain the company from continuing the work of construction. The new allegations in the bill correspond to the main ones in the bill recently filed against the company by other parties. The transfer and sale of the stock, property and franchises of the Lake Street Elevated Railway Company to the Lake Street Elevated Railroad Company is claimed to be void under the statute, and a section of the Railroad and Warehouse Act is quoted to the effect that the only way one corporation can acquire the property of another is by trust and foreclosure. This method was not pursued by the Company. The validity of the ordinances passed relative to the building of the road is called in question on the ground, among other things, that the required consent of the property owners was not obtained.

Another elevated railroad is proposed for the North Side. This is the Citizens' North Side Rapid Transit Company, incorporated last week at Springfield, with a capital of $5,000,000. This purports to be the outcome of a citizens' movement to furnish the residents of the northern suburbs with better means of transportation than they have at present. The incorporators say but little at present as to their plans, except that they propose to build from the Chicago River north to the city limits.

LOCOMOTIVE BUILDING.

The Missouri Pacific placed an order this week with the Baldwin Locomotive Works for 30 ten-wheel locomotives.

The Wilkes-Barre & Eastern placed its order for equipment this week, and awarded the contract for 13 engines to the Rogers Locomotive Works.

CAR BUILDING.

Murray, Dougal & Co., of Milton, Pa., have a contract for building 500 freight cars for the Wilkes-Barre & Eastern Railroad.

The Ohio River Railroad has ordered six new passenger cars for its through traffic between Wheeling, W. Va., and Huntington, W. Va.

BRIDGE BUILDING.

Allegheny City, Pa.—A petition was recently presented to the Quarter Sessions Court asking for the appointment of viewers to inquire into the advisability of the erection of a bridge, at the cost of the taxpayers of the county, between Locust street, Allegheny City, to near Corks Run, in Esplenborough. If the report of the viewers is favorable the question will go before the grand jury, and on favorable action the county commissioners will proceed to build the bridge.

British Columbia.—The bill to authorize a grant in aid of the construction of a bridge across the Fraser River at New Westminster states that the cost of the enterprise is estimated at $500,000. The bill makes it lawful for the city of New Westminster to aid in the building of the bridge to the extent of $250,000. The amount of government aid is fixed at $62,500, payable in five annual installments after the completion of the bridge.

Buzzard's Bay, Mass.—A committee of the Massachusetts Legislature has approved the site of the proposed bridge over Monument River, near Buzzard's Bay, and the bill authorizing its construction will probably soon become a law.

Fairmont, W. Va.—Citizens of Fairmont have subscribed $1,000 toward building a suspension bridge over "The Ravine" which separates West Fairmont from South Fairmont. The county court of Marion County will be asked to supply the balance of the money needed.

Morgantown, W. Va.—Plans are being prepared and surveys made for a highway bridge over Deckde's Creek, near where it empties into the Monongahela River, near Morgantown, W. Va. A suspension bridge is in contemplation.

Minneapolis, Minn.—The foundations for the Great Northern bridge across the east channel of the Mississippi River are completed, and the work on the masonry piers has been begun. The Edge Moor Bridge Works will construct the superstructure.

New York City.—The Board of Aldermen, by a vote of 16 to 12, this week granted the East River Bridge Co. permission to operate a system of railroad approaches to its bridges across the East River, but provided that the company must carry passengers from any station on the approaches in New York across the bridge to any station on the Brooklyn side for five cents. The bridges proposed by the company are: (1) A bridge from Cannon street between Rivington and Delancey streets to a point between South Fifth and South Sixth streets, Williamsburgh. (2) A bridge landing in New York in Grand street between Jackson and Scammel streets, and in Brooklyn between Hudson avenue and Bridge street. Chief Engineer Cornell of the bridge company says that the work of construction on Bridge No. 1 would begin by May 1. The general details of the structure have already been published in these columns. The span will be 1,670 ft.; the total length from anchor to anchor, 3,200 ft. The towers will be 280 ft. high, and the centre of the bridge above mean high water will be 140 ft., five feet higher than the present suspension bridge. The company is capitalized for $25,000,000. Frederick Uhlman, President of the Union Elevated Railroad Co., of Brooklyn, is its President. George S. Wingate, Adolph Ladenburg, George Hoadly and Edward Lauterbach are among the directors.

The bill of Mr. Marrin to authorize the Commissioners of Public Parks to construct a bridge from 125th street and First avenue, across First avenue to and along Willis avenue to 134th street, passed the House of Assembly this week.

Niobrara, Neb.—The large bridge spanning the Niobrara River, which was partially destroyed by ice and water last week, will be replaced during the season.

Northport, Wash.—A contract has been let to the Dominion Bridge Co. for the construction of a steel cantilever bridge over the Pend d'Oreille River just above where it enters the Columbia, and work on the bridge is now under way, and the piers are being built. The bridge is for the Spokane Falls & Northern Railroad.

Paisley, Ont.—The County Council of Bruce, Ont., are calling for tenders for the construction of a one-span iron or steel bridge over the Saugeen River, north of

Paisley. Also for a substructure for the same, to consist of cylinders filled with concrete and resting on piles. Length of span 200 ft. between cylinders, width of roadway 16 ft. clear, working load 1,200 lbs. per lineal foot. Height of floor from surface of water 15 ft. Ordinary depth of water 8 to 10 ft.

Portland Station, O.—The Cleveland & Pittsburgh Railroad will build a new plate girder bridge over Short Creek, at Portland Station, to take the place of a covered wooden bridge which has been in use since the road was opened. The new bridge will be about 100 ft. in length. It will be erected without disturbing traffic over the old bridge.

Rock Island, Wash.—The Great Northern bridge across the Columbia River at this point is well under way. The contractors state that they will complete the long span this week. The superstructure is being built by the Edge Moor Bridge Works.

Steelton, Pa.—A company is being organized to build a bridge over the Susquehanna River, between Steelton and New Cumberland, Pa.

West Falmouth, Mass.—A bill is under consideration in the Massachusetts Legislature authorizing the building of a bridge over an arm of West Falmouth Harbor.

Weston, W. Va.—A largely-signed petition has been presented to the County Court of Lewis County, W. Va., asking that a new highway bridge be constructed over Stone Coal Creek, near Weston. The preliminary steps looking to the granting of the petition have been taken by the court.

MEETINGS AND ANNOUNCEMENTS.

Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Maine, $2 per share, payable March 31.
Keokuk & Western, semi-annual, 1 per cent., payable April 1.
New Castle & Beaver Valley, quarterly, 1½ per cent., payable April 1.
New York Central & Hudson River, 1¼ per cent., payable April 15.
New York & Harlem, semi-annual, 2½ per cent. on the common and preferred stock, payable April 1.
Norfolk & Southern, quarterly, 1 per cent., payable April 10.
Pennsylvania, semi-annual, 4 per cent.
Pittsburgh, Cincinnati, Chicago & St. Louis, semi-annual, 2 per cent. on the preferred stock, payable April 17.
Pittsburgh, Youngstown & Ashtabula, semi-annual, 3½ per cent. on the preferred stock and 3 per cent. on common stock, payable March 27.
Rio Grande Western, quarterly, 1¼ per cent. on the preferred stock, payable May 1.
Southwestern Pennsylvania, semi-annual, 5 per cent., payable March 31.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Atlantic Avenue Elevated, annual, Brooklyn, N. Y., April 18.
Chicago & Alton, annual, Chicago, Ill., April 3.
Cleveland, Canton & Southern, special, Canton, O., March 29.
Fort Worth & Rio Grande, annual, Fort Worth, Tex., April 4.
Joliet & Chicago, annual, Chicago, April 3.
Louisville, New Albany & Chicago, special, Indianapolis, Ind., April 12, to consider an increase of stock.
Mohawk & Malone, special, Albany, N. Y., April 19, to approve of the lease to the New York Central & Hudson River.
New York Central & Hudson River, annual, Albany, N. Y., April 19.
New York, New Haven & Hartford, special, New Haven, Conn., April 4, to ratify the lease of the Old Colony.
Northern Pacific, special, New York City, April 20.
Panama, annual, New York City, April 3.
Pennsylvania, annual, Philadelphia, Pa., March 28.
Pittsburgh, Cincinnati, Chicago & St. Louis, annual, Pittsburg, Pa., April 11.
Southwestern, special, Macon, Ga., April 12.
Staten Island Rapid Transit, annual, New York City, April 25.
Tennessee Coal, Iron & Railroad Co., biennial, Tracy City, Tenn., April 4.
Union Pacific, annual, Boston, Mass., April 26.
West Virginia Central, annual, 1727 North Tenth street, Philadelphia, Pa., March 30.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The American Association of General Passenger and Ticket Agents will hold its annual meeting at Cumberland Gap Park, Tennessee, March 21.

The *New England Railroad Club* meets at the United States Hotel, Boston, Mass., on the second Wednesday of each alternate month, commencing January.

The *Western Railway Club* meets at the rooms of the Central Traffic Association in the Rookery Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 7:30 p. m.

The *Northwest Railroad Club* meets at the Ryan Hotel St. Paul, on the second Tuesday of each month, except during June, July and August, at 8:00 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, Bromfield street, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Western Society of Engineers* meets at 78 La Salle street, Chicago, on the first Wednesday in each month, at 8 p. m.

The *Engineers' Club of St. Louis* meets in the Odd Fellows' Building, corner Ninth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Engineers' Society of Western Pennsylvania* meets at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month at 8 p. m.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The Denver Society of Civil Engineers meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7:30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday except during the months of June, July, August and September.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Tacoma Society of Civil Engineers and Architects* meets in its rooms, 201 Washington Building, Tacoma, Wash., on the third Friday in each month.

The *Association of Engineers of Virginia* holds informal meetings the third Wednesday of each month, from September to May inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Civil Engineers' Association of Kansas* meets at Wichita, Kan., on the second Wednesday of each month, at 7:30 p. m.

The *American Society of Swedish Engineers* meets at the clubhouse, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

American Society of Civil Engineers.

At the meeting of March 1 a brief paper on the "Us of Steam Motors in the Streets of Sydney, New South Wales," by Geo. Downe, M. Am. Soc. C. E., was read by the Secretary. There are five main lines leading into the city, and these all converge into one at three-quarters of a mile from the terminal station. From these main lines there are eight branch lines, three of which have engines running to the junction only, the engines of the other five running to the terminus. Curves on the lines range from 80 to 196 ft. radius, and grades up to 6 per cent. Fully one-third of all the lines are constructed on grades of 3 to 5 per cent., the latter predominating. There are 106 motors in use, 93 of which were constructed by the Baldwin Locomotive Works. All are four-wheel, coupled, and most of them have 11×16-in. cylinders and 35-in. wheels; 67 are in use in daily ordinary traffic. Trains are made up with one to four cars as required, the average being two and a quarter cars. Each car has a seating capacity of 70 persons, making the average train capacity 158 persons, with a weight, when loaded, of 82,880 lbs.

The average annual service per motor is 29,072 miles, at an average speed of 10 miles per hour. All under-gear is exposed to both dust and mud. The average mileage of one-eighth of the motors in steam is 100 to 130 miles, and the average of all over 80 miles per day.

At the meeting of March 15 a paper by Thomas W. Symons, Captain Corps of Engineers, U. S. A., on the "Jetty Harbors of the Pacific Coast," was read. The paper deals with the plans of improvement adopted, the results obtained by their execution and the lessons learned.

At Port Orford, in Oregon, and San Pedro, in California, harbors are proposed for deep ships to be formed by breakwaters. Jetties have been and are under construction at other points.

The first jetty to be constructed on the Pacific coast was at Yaquina Bay. This is a narrow estuary 20 miles long and 115 miles south of the Columbia River; its tidal area is five square miles, and its drainage area 262 square miles. The average height of tide is 7 ft. and maximum range 11 ft. The mean outflow of tide at ebb is 32,000 cu. ft. per second, and the channel, carrying 7 ft. at low tide across the bar, was constantly shifting in position. A quarter of a mile out from this bar is a reef of rocks which broke the swell and acted as a breakwater. The depth inside was four to five fathoms. Examinations by boring showed that the maximum depth to be expected by scour was 18 ft. The heavy waves of winter assume a motion of translation at depths of 8 to 10 fathoms and carry great masses of sand shoreward.

The plan of improvement adopted was to construct two jetties 2,300 ft. apart at the harbor throat and converging to 1,000 ft. at deep water, the north one being 3,600 ft. and the south one 2,300 ft. long. These were so located as to deflect the channel to the south of the reef. The reasons for this location are given at length. The jetties are rubble mounds reaching to high water. The south jetty was built on brush mattresses 4 ft. thick resting on sand, and the north one on the rock-bed. The tramways by which the work was done are described. An interesting feature was the use of a revolving pile-driver, which could drive piles 15 ft. in advance. The mattresses were of brush fascines and pole-bound together, and were constructed underneath the tramway tracks and around the piles, loaded with stone and sunk. The sinking of piles in sand is now done entirely by the hydraulic method. The total cost of the jetties was about $90 per linear foot. The result reached has been to double the low-water depth on the bar and maintain it in a good location; the least depth for a year has been 14 to 15 ft. Outside of the channel, against the jetties, great quantities of sand have accumulated. It was only when both jetties were completed that permanency ensued in channel, as before the north jetty was finished the channel wandered greatly.

At the mouth of the Columbia River the work is about completed, and the largest vessels can now sail in and out easily. Cape Disappointment, at the entrance, is a rocky headland, and Point Adams, six miles distant to the southeast, is a low, shifting sandy point. The bar extends in a curve convex to the sea, with its vertex four miles out. Inside, there were shoals and sand islands among which the channel ran, with a depth on the bar of 19 to 27 ft. The estimated mean tidal discharge is 1,000,000 cu. ft. per second. The fresh water discharge from the river is 90,000 ft. at low water, and 600,000 when the river is high. A jetty consisting of a rubble mound built on mattresses 3 ft. thick and 40 ft. wide was built up to low water. It reached in a northwesterly direction from Point Adams to a point three miles south of Cape Disappointment, and is 4¾ miles long. The object was to concentrate the water of the river within a moderate width and discharge it as a unit to the sea. The result has been to increase the depth at low water to 29 ft. in a single channel, thus far permanent, which is 1,300 ft. wide; at 27 ft. depth it is one mile wide. The jetty has cost $83 per linear foot. The jetty, while called a low-tide jetty, has really been built 4 ft. higher, to allow for subsidence.

American Society of Railroad Superintendents.

C. A. Hammond, Secretary, has issued notice of special meeting of the Society, to be held at the Grand Pacific Hotel, Chicago, on Monday, April 10. It will be called to order at 10:30 a. m., and the principal business will be: Election of President to fill the vacancy caused by the death of H. Stanley Goodwin; reports from committees; discussion upon the following topics: (*a*) Papers and reports read at the last meeting. (*b*) Recent improvements in signal practice. (*c*) Experience in working under the Standard Code. (*d*) Methods of examining and instructing railroad employés and the adoption of a railroad catechism. (*e*) How can we increase the usefulness of our Society?

It is hoped that this meeting will be largely attended, and the usual invitation is extended to all railroad superintendents to be present. Members attending will have the opportunity of participating in excursions to the grounds of the World's Columbian Exposition and and other points of interest.

General Superintendent H. F. Royce, of the Chicago, Rock Island & Pacific, will secure accommodations for members upon application to him. He states that the Grand Pacific can take care of the larger portion attending, but if no hotel is designated he will see that members are well placed if advised as to terms and location desired.

Boston Society of Civil Engineers.

The annual meeting of the Society was held at its rooms, 36 Bromfield street, on Wednesday, March 15, 1893, at 7:30 o'clock p. m., 63 members and 10 visitors present.

Laurence B. Manley, of Boston; Asa M. Mattice, of Cambridge; Arthur D. Ropes, of Melrose, and Ernest P. Whitten, of Brookline, were elected to membership.

The annual reports of the various committees were received. From that of the Board of Government it appears that there has been a net gain of 20 in the membership of the Society, the present number of members being 310. The regular meetings have been held during the year with an average attendance of 71.

The result of the election of officers for the ensuing year was: *President*, John R. Freeman; *Vice-President* (for two years), George F. Swain; *Secretary*, S. Everett Tinkham; *Treasurer*, Edward W. Howe; *Librarian*, Henry F. Bryant; *Director* (for two years), Henry Manley.

The literary exercises of the evening consisted of short addresses by members of the Society on the relations of the engineer to those with whom he comes in professional contact. Mr. Desmond FitzGerald spoke on the relations of the engineer to his brother engineer; Mr. John W. Ellis, of the engineer in politics and as a public officer; Mr. W. E. McClintock, on the engineer in his relations to the public and the press; Mr. Percy M. Blake, on the engineer as a contractor; Mr. M. M. Tidd, on the engineer as an expert witness; Mr. A. F. Noyes, on the engineer in his relations to his assistants; and President Manley closed the speaking with some remarks on the engineer as a man.

The Civil Engineers' Club of Cleveland.

The annual meeting was held March 14 with President Rice in the chair. The annual reports of the Secretary, Treasurer and Librarian were read. For the programme committee Mr. W. R. Warner read a report on "The Progress of Mechanical Engineering During the Past Year," and Prof. E. P. Roberts read a similar report on "The Progress of Electrical Engineering."

W. T. White, F. J. Falding, N. B. Dare and J. B. Davis were elected active members and W. W. La Chance and J. W. Willard associate members.

The following officers were elected to serve during the coming year: *President*, A. H. Porter; *Vice-President*, C. S. Howe; *Secretary*, F. C. Osborne; *Treasurer*, C. P. Leland; *Librarian*, C. H. Benjamin, and *Directors*, C. W. Wason and James Ritchie.

The paper of the evening was the annual address of the President on the subject "The Mission of a Local Civil Engineer's Society."

Engineers' Club of St. Louis.

The Club met at 8 p. m., March 15, at the Club rooms, President Moore in the chair, and 33 members and three visitors present.

The resignation of Mr. Geo. H. Pegram as a Director of the Club, owing to absence from the city, was announced. On motion, Mr. Edward Flad was nominated to fill the vacancy.

A letter from Mr. Corthell was read, announcing the expected visit of a party of members of the French Society of Civil Engineers during the coming summer, and suggesting a visit to St. Louis. On motion, it was decided that Mr. Corthell be notified that the Club would take great pleasure in receiving the party and doing what they could to entertain them.

Mr. Robert Moore then read the paper of the evening on "Some Notes on European Railways." By means of a chart, the mileage, cost, receipts, expenses, etc., of the railroads of the world was clearly shown. The cost per mile was highest in Great Britain—$212,220—and lowest in Sweden, $29,100. The interest on capital was: 5.2 per cent. in India, 5.1 per cent. in Germany, 4.1 per cent. in Great Britain, 3.1 per cent. in the United States and 1.7 per cent. in Canada. The track and chair fastenings were illustrated by a number of photographs. This method gave a steadier track than the usual American method of using spikes only. A number of fine photographs showed the English engines and cars. The high cost of the English roads was shown to be largely due to the expensive bridges, terminals, etc. A marked feature of the English roads was the rapid handling and delivery of freight, freight received at London during the afternoon being delivered at any point the next morning.

Discussion followed by Messrs. Kinealy, Schaub, Johnson, Hermann, Colby.

New York Railroad Club.

The New York Railroad Club requests, not later than April 7, 1893, suggestions toward modifying or making additions to the "Code of Rules Governing the Condition of and Repairs to Freight Cars for the Interchange of Traffic."

All suggestions and recommendations will be discussed at the next regular meeting of the Club, which will be held April 20, 1893; the recommendation of the Club to be forwarded to the Secretary of the Master Car Builders' Association for discussion before the Arbitration Committee at their next and last meeting before the annual convention.

Suggestions should be addressed to A. E. Mitchell, Supt. Motive Power, N. Y., L. E. & W. R. R. Co., 21 Cortlandt Street, New York.

Rensselaer Polytechnic Institute.

A lecture on the "Design of Sewerage Systems" was delivered before the students of the Rensselaar Polytechnic Institute at Troy, N. Y., March 16, by Rudolph Hering.

Southern & Southwestern Railway Club.

Secretary S. A. Charpiot announces that the next meeting of the Club will take place at the Kimball House, Atlanta, Ga., on Thursday, April 20, at 10 o'clock.

The subjects for discussion will be: Air Brake Practice; Draft Rigging Appliances; Soft Plugs for Crown Sheets of Fireboxes, as announced in the *Railroad Gazette* of Feb. 17.

Western Railway Club.

The Western Railway Club held its regular meeting March 21 at the rooms of the Central Traffic Association in "The Rookery," at Chicago. Suitable resolutions regarding the death of Prof. A. T. Woods were adopted, and copies of the same will be sent to the wife and mother of the deceased.

A paper written by Mr. F. C. Cleaver, of the Terre Haute & Indianapolis Railroad, on a comparative test of a compound and simple engines built by the Pittsburgh Locomotive Works was read and ordered printed in the proceedings. Mr. Cleaver's paper was discussed by members of the Club, after which followed a discussion of the paper read at the last meeting by Mr. William Forsyth, in which Mr. Rhodes, Mr. Forsyth, Mr. Quereau, of the C., B. & Q.; Mr. Barr, of the C., M. & St. P., and Mr. Barnes, of the *Railroad Gazette*, took part. Mr. Barnes had prepared a number of tables and diagrams to illustrate his remarks, and these will appear later in the *Railroad Gazette*.

Mr. Rhodes stated that as a result of these tests the management of the C., B. & Q. has decided on the design of their Class "M" engine for their fast passenger and special fast through freight service, and the Mogul Class "H" for heavier and slower service. The Class "M" has 18 × 24 in. cylinders, 62 in. drivers; total heating surface, 1,412.4 sq. ft.; total weight of engine in working order, 100,000 lbs.

PERSONAL.

—Mr. J. F. Townsend, General Traffic Agent of the Cleveland, Loraine & Wheeling, has tendered his resignation to accept a position with another company.

—Mr. Robert Collins, General Freight and Passenger Agent, and J. C. Matthews, Superintendent of the Houston, East & West Texas road, have been removed by the recently appointed receivers.

—The Illinois Railroad & Warehouse Commissioners have agreed on the appointment of Richard T. Morgan & Son, of Dwight, Ill., as Consulting Engineers for the Board, vice Charles A. Hansel, resigned.

—Mr. W. H. Fry, recently Superintendent of Equipment of the Pullman's Palace Car Co., has been appointed Superintendent of the Car Department of the New York, New Haven & Hartford.

—Mr. C. H. Ackert, who has been General Manager of the Iowa Central for many years, resigned last week. It is announced that he has accepted a similar position on another road, but the company is not stated.

—Mr. E. H. Hinton, formerly the General Freight Agent of the Texas & Pacific, has been appointed the Pacific Coast Agent of the Panama Railroad. He will take charge on April 1, and will have headquarters at San Francisco.

—Mr. J. H. Garaghty, Purchasing Agent of the Cleveland, Cincinnati, Chicago & St. Louis, has resigned, to take effect April 1. Mr. Garaghty left the Columbus, Hocking Valley & Toledo three years ago to enter the service of the "Big Four."

—Gen. Wade Hampton, of South Carolina, has been nominated by President Cleveland to be United States Railroad Commissioner. General Hampton served in the Confederate Army, and in 1864 became Lieutenant General. In 1878 he was elected United States Senator and served until 1891.

—Mr. Charles N. Kight, Division Passenger Agent of the East Tennessee, Virginia & Georgia, at Atlanta, Ga., has resigned and will remove to Monroe, La., where he is interested in an improvement company. Mr. Kight was formerly Assistant General Passenger Agent of the company for some years, but his title was changed last fall with three other officers of the same rank to Division Passenger Agent at the reorganization of the Passenger Department.

—Mr. George F. Randolph, whose appointment as General Traffic Manager of the New York & New England has already been noticed, has been First Assistant General Freight Agent of the Philadelphia & Reading for the last year, and he was General Freight Agent of the New York & New England before assuming that position. Mr. Randolph was also General Freight Agent of the Elmira, Cortland & Northern at the time that Mr. McLeod was General Manager, and subsequently he was connected with the West Shore and other large lines.

—Mr. S. H. H. Clark was elected President of the Missouri Pacific at a meeting of the directors in New York City, March 22. Mr. George J. Gould was elected First Vice-President. Mr. Clark has retained this title during his term in the Presidency of the Union Pacific. The names most commonly mentioned in the gossip as to Mr. Clark's successor as President of the Union Pacific are those of Mr. Oliver W. Mink, of Boston, for many years Comptroller of the company, and also Mr. Joseph H. Millard, of Omaha, who has been a director for a long period.

—Mr. J. J. Frey has been appointed General Manager of the Atchison, Topeka & Santa Fe, with office at Topeka, Kan. The appointment takes effect April 3, the date of Mr. A. A. Robinson's resignation as Second Vice-President and General Manager. The office of Vice-President will not be filled for the present. Mr. Frey was formerly General Superintendent of the Missouri, Kansas & Texas. He entered the company's service as Superintendent, and became General Superintendent under the Receivers. He resigned last month, and was appointed Vice-President and General Manager of the Sherman, Shreveport & Southern road, in Texas, a reorganization of the old East Line & Red River road.

—The resignation of Mr. A. A. Robinson as Second Vice-President and General Manager of the Atchison, Topeka & Santa Fé, to enter the service of another company, is announced this week. Mr. Robinson became Chief Engineer of the Atchison road in 1873, and he has been at the head of its construction department for nearly 20 years, resigning the title in 1892. He was also General Superintendent from 1883 to March, 1884, then General Manager and Chief Engineer, and in 1886 was appointed Vice-President also.

At the time of taking his degree at Michigan University, in 1869, Mr. Robinson was considered the most scholarly and accomplished engineer of his class. He at once entered railroad service as an axe-man in an engineering corps, and with no outside help or influence he became in less than two years assistant engineer in charge of location and construction of the Atchison, Topeka & Santa Fé Railroad. Within another two years he was its chief engineer, and nearly 7,000 miles of the more than 9,000 miles of road now comprised in that system have been built under his direction and supervision, and this has involved the solution of some of the greatest engineering problems ever encountered in American railroading.

As Chief Engineer, General Manager and Vice-President during the past seven years Mr. Robinson has developed as high an order of ability in operating as he has shown in construction.

It is not stated with what company Mr. Robinson is to be connected, but it is understood to be the Union Pacific, and that he will be General Manager.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—J. J. Frey has been appointed General Manager, with office at Topeka, Kan. W. G. Fuller, who lately resigned as General Purchasing Agent of the road, has been restored to that position, relieving H. C. Ives, who is assigned to other duties in the transportation department. J. D. Springer having resigned as Third Vice-President to enter the service of the Chicago Elevated Terminal Co., the office will not be filled at present. All business connected with the traffic affairs of the company heretofore reported to and transacted through the Third Vice-President will be conducted directly, as to freight traffic, with J. A. Hanley, Freight Traffic Manager, and the passenger traffic with W. F. White, Passenger Traffic Manager. The headquarters of all these officials will be in Chicago.

Buffalo, Rochester & Pittsburgh.—P. W. Croak has been made Assistant Superintendent of Motive Power in charge of the division from Buffalo to Punxsutawney. He was formerly Foreman of the Du Bois shops, and more recently Foreman of the shops at Bradford, Pa. General Superintendent J. H. Barrett is to move his office to Buffalo on May 1.

Chicago, Milwaukee & St. Paul.—P. H. Scanlan has been appointed Traveling Passenger Agent, vice C. R. Lewis, assigned to other duties.

Chicago & Northern Pacific.—The annual meeting was held at Chicago March 16. The officers and directors were re-elected as follows: President, D. S. Wegg; Vice-Presidents, J. B. Williams and J. L. High; Secretary, H. S. Boutelle; Treasurer, G. S. Baxter. No change was made in the Board of Directors, D. S. Wegg and J. B. Williams, the retiring directors, being elected to succeed themselves.

Chicago, St. Paul & Kansas City.—Superintendent J. A. Kelly, who has been in charge of the Kansas City Division, has been transferred to the Chicago Division, with headquarters in Chicago. J. C. Ford, formerly Superintendent of Telegraph, has been appointed to succeed Mr. Kelly on this division. G. M. McNab, of Chicago, will be made Superintendent of Telegraph.

Chicago, St. Paul, Minneapolis & Omaha.—The office of Assistant General Passenger Agent, recently resigned by J. S. McCullough, has been abolished. C. H. McRae, formerly Chief Clerk of Passenger Accounts, has been appointed Chief Clerk to T. W. Teasdale, General Passenger Agent.

Cleveland, Akron & Columbus.—Mills W. Barse, Frank Barnaby and J. A. Horsey, of New York; N. Monsarrat and J. S. Norton, of Columbus, O.; George W. Saul, of Springfield, O., and Henry Moorehead, of Cincinnati, were elected directors of the company at Columbus, O., on March 16. Mr. Horsey, who represents the Holland syndicate, and General Manager Monsarrat are the only directors re-elected. Messrs. Barse, Barnaby and Saul are interested in the Ohio Southern, the latter being President. Mr. Saul was elected Chairman, and the Board then adjourned to meet in New York March 28.

Cleveland, Lorain & Wheeling.—J. E. Terry, General Agent of the Wheeling & Lake Erie at Steubenville, O., has been elected General Freight and Passenger Agent of this company, with headquarters at Cleveland.

Cleveland & Marietta.—E. W. Page has been appointed General Freight and Passenger Agent, to succeed W. K. Richards, resigned, with office at Cambridge, O.

East Tennessee, Virginia & Georgia.—James Farnsworth will succeed C. N. Kight as Division Passenger Agent of the road at Atlanta, Ga.

Great Northern.—Cornelius Shields, General Superintendent of the Western Division, has succeeded C. W. Case, General Superintendent of the Eastern Division. It is also announced that General Manager A. L. Mohler is to be transferred to the executive department and made First Vice-President of the road.

Intercolonial.—Grant M. Hall has been appointed Mechanical Engineer, with headquarters at Moncton, N. B., to succeed E. May. Mr. Hall has been connected with the Canadian Pacific recently in the mechanical department at Windsor Station, Montreal.

Kansas City, Pittsburgh & Gulf.—James Donahue has been appointed General Freight and Passenger Agent of this road and of the Kansas City Suburban Belt. He was formerly Commercial Agent of the Missouri, Kansas & Texas.

Lake Shore & Michigan Southern.—L. E. Johnson, late Division Superintendent of the Great Northern, has been appointed Superintendent of the Michigan Division of this road, vice T. F. Whittlesey, resigned.

Merchants & Miners' Transportation Co.—The following appointments have been made: A. D. Stebbins, Assistant Traffic Manager; W. P. Turner, General Passenger Agent, and J. M. Watkins, Auditor, with offices in Baltimore.

Mexican Southern.—C. W. Carnegy, formerly Agent for the Mexican National at Santiago, Mex., has been appointed Auditor, with headquarters at Puebla, Mex.

Missouri Pacific.—At the meeting of Directors in New York S. H. H. Clark was elected President of the company. George J. Gould takes Mr. Clark's place as First Vice-President, and C. G. Warner, formerly General Auditor, was elected Second Vice-President, A. H. Calef was re-elected Secretary and Treasurer, and Guy Phillips Assistant Secretary. The executive officers elected by the Directors of the St. Louis, Iron Mountain & Southern are the same as those of the Missouri Pacific.

Montreal & Sorel.—The annual meeting was held at Montreal, March 14, when the following were elected directors: C. N. Armstrong, T. T. Turnbull, R. Prefontaine, M. S. Lonergan and S. G. J. Fossbrooke. The directors elected C. N. Armstrong and T. T. Turnbull, President and Vice-President, respectively, and R. Watson, Secretary-Treasurer.

Nevada Southern.—The following is a list of the officers of this new California road: President, Isaac E. Blake, Denver, Col.; Vice-President, Walter F. Crosby, Colorado Springs, Col.; Secretary and Treasurer, George C. Manly, Denver; Assistant Secretary and Treasurer, H. B. Parsons, New York, N. Y.; Auditor, Chas. B. Mason, Denver; Chief Engineer, Robert F. Burns, Williams, Ariz.; General Manager, R. S. Seibert, Needles, Cal., and Purchasing Agent, F. L. Morgan, Needles.

New York, Lake Erie & Western.—H. S. Burgesser, Assistant General Freight Agent, has resigned, and the duties of his position will hereafter be attended to by H. B. Chamberlain, recently appointed General Freight Agent.

New York & New England.—George H. Earle, Jr., President of the Finance Company of Pennsylvania, who was chosen one of the directors of the above road at the annual meeting last week, has declined the election. J. W. Doane, of Chicago, was elected director last week, and not J. W. Deane, as reported. Mr. Doane, is one of the largest wholesale grocers in the West.

New York, New Haven & Hartford.—W. H. Fry has been appointed General Superintendent of the Car Department, taking effect March 16, with office at New Haven, Conn. He will have charge of all matters pertaining to the company's car shops and cars.

Oregon Pacific.—Judge Ingraham, of the New York Supreme Court, has issued an order confirming the appointment of E. W. Hadley as Receiver of the road, and directing ex-Receiver T. Egerton Hogg to turn the books in his possession over to the Farmers' Loan & Trust Co., the trustees of the bonds.

Oregon Short Line & Utah Northern.—George Gould and Alexander E. Orr have been elected directors of the company to fill vacancies caused by the deaths of Jay Gould and Sidney Dillon.

Pennsylvania.—The committee of shareholders appointed last week to nominate a ticket for directors to be voted for at the annual election on March 28 nominated the present board: George B. Roberts, Alexander M. Fox, Alexander Biddle, N. Parker Shortridge, Henry D. Welsh, William L. Elkins, H. H. Houston, A. J. Cassatt, Clement A. Griscom, B. B. Comegys, Amos R. Little, William H. Barnes, George Wood, Frank Thomson, John P. Green and Charles E. Pugh. Third Vice-President Pugh fills the vacancy in the board caused by the death of J. N. Du Barry.

Philadelphia, Honesdale & Albany.—The charter of this company was filed in Pennsylvania last week. The President is Henry Z. Russell, of Honesdale, Pa. The local directors at Honesdale are W. W. Weston, J. M. Baumann and three others. The following are also directors: C. W. Raymond, Middletown, Pa; L. H. Taylor, Jr., and G. W. Kendrick, Jr., Philadelphia; J. C. Tennis, Thompsontown, Pa.; G. F. Roess, Oil City, Pa., and F. F. Whittekin, Tionesta, Pa.

Philadelphia & Reading.—Theodore Voorhees, First Vice-President, has issued his first official order, announcing a reorganization of his department. General Manager Sweigard, the order states, will hereafter give his exclusive attention to the operation of the main line division, instead of the general management of the system. Division Superintendents who formerly reported to the General Manager will now report to the First Vice President, and, except in the case of the main line division, the duties of General Manager will be performed by Mr. Voorhees.

Pittsburgh & Western.—The office of William Truby, Superintendent of the Western and Lake divisions, located at New Castle Junction, has been removed to Allegheny, Pa. J. V. Patton, General Superintendent, has transferred his office from Allegheny to Pittsburgh.

Santa Fe, Prescott & Phœnix.—The following is the list of the present officers: D. B. Robinson, President, Chicago; G. W. Vaughn, Vice-President and Chief Engineer, Prescott, Ariz.; F. M. Murphy, Secretary, Prescott, and E. M. Dickey, Treasurer, Chicago.

Sherman, Shreveport & Southern.—The first meeting of the directors under the new charter was held at Greenville, Tex., March, 13. W. B. Munson, of Denison, was elected President, and J. J. Frey, Vice-President and General Manager (since resigned). Following are the directors: T. Randolph, of Sherman; W. B. Munson, of Denison; W. T. Atkins, of Jefferson; W. Giles, of Mineola; W. A. Williams and T. King, of Greenville. H. N. Marache was elected Secretary and Treasurer. The heads of the departments announced are: H. N. Marache, Auditor; E. M. Alvord, General Superintendent; J. W. Chatham, General Freight and Passenger Agent.

Texas Midland.—W. E. L. Pearce, of Galveston, formerly Chief Clerk of the Gulf, Colorado & Santa Fe, has been appointed Auditor of this company, with office at Terrell, Tex.

Vicksburg, Shreveport & Pacific.—John H. Murphy, formerly Division Master Mechanic of the New York, Lake Erie & Western, and recently Master Mechanic of the New York, Ontario & Western at Carbondale, Pa., has been appointed Master Mechanic of the Vicksburg, Shreveport & Pacific, with headquarters at Monroe, La.

Virginia, Tennessee & Georgia Air Line.—Hugh R. Knox has been appointed Contracting Freight Agent of this fast freight line, with office at New York City.

Wilkes-Barre & Eastern.—The officers of this road are: President, W. P. Ryman and Vice-President, Dewitt H. Lyon, both of Wilkes-Barre, Pa. The officers of the Wilkes-Barre & Hudson River Improvement Company, which is building the road, are: President, Charles A. Ludington; Vice-President, Guy Van Amringe, both of 59 Wall street, New York City; Chief Engineer, Robert L. Harris, Wilkes-Barre, and Treasurer, Homer W. Reboul, Exchange Court, New York City. Mr. Harris has also an office at 59 Wall street, New York.

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Abbeville Southern.—The local officers of this company have secured the right of way for the line to Abbeville, and a recent letter states that they are now about ready to let the contract. The company was organized at Abbeville, Ala., last fall, and S. W. McLendon, of Thomasville, Ga., is President, and W. E. Bradley, of Abbeville, Secretary and Treasurer. The road is to be built from a connection with the Alabama Midland at Dotham northeast to Abbeville, a distance of 28 miles. The local company will secure the right of way and grade the road, and it is expected that the directors of the Plant system will complete the line and operate it as a branch of the Alabama Midland.

Akron & Eastern.—The probabilities of work being begun this year on the road east of Akron, O., are being hopefully discussed in the local newspapers. It is stated that the necessary capital has been raised to build the line from Akron to New Castle, Pa., 70 miles. The line is projected as an extension of the Pittsburgh, Akron & Eastern, and was surveyed in 1892.

Baltimore & Ohio.—The improvements at South Cumberland, Md., are being pushed with all possible rapidity since good weather has set in. Two steam shovels are now at work on the grading and another will be put in operation this week, East and west bound through tracks have been laid through what will be the new yard, and the signaling apparatus and switches have been put in. It is thought by May 1 the grading and tracklaying will be about done, and shortly after that time the yards will be in use.

Cambria & Clearfield.—It is announced by the officers of the Pennsylvania Railroad that the four miles of this branch road between La Jose, Pa., and its junction with the Beech Creek road near Mahaffey, Pa., was opened for regular traffic on March 10. This is part of the joint line built with the Beech Creek road last fall, and by connecting the lines of the two companies gives the Pennsylvania an entrance to the entire Beech Creek bituminous coal region. The Beech Creek road will also run its trains over the Cambria & Clearfield to the Chest Creek mines and to the Pennsylvania road at Kaylors Pa.

Chicago, Indiana & Eastern.—A meeting of citizens was held at Peru, Ind., last week, and was addressed by W. M. Nichols, of West Superior, Wis., one of the projectors of the above road, in regard to the plans of the company. A committee including Mayor Zern, of Peru, was appointed to consult with the directors and see what arrangements can be made for building that part of the line from Peru southeast to Muncie, Ind., about 50 miles.

Duluth, Pierre & Black Hills.—James A. Ward, of Pierre, S. D., General Manager, visited the town of Aberdeen, N. D., recently and asked that the town give the right of way through the city and terminal facilities for the road. It is reported that the directors have finally made arrangements to finish the road, and that the funds will be secured through a Mr. Larned, of New Orleans. The road is now ready for the track from Aberdeen southwest to Faulkton, 45 miles, the grading having been done in 1891. The southern terminus will be at Blunt, a point near Pierre, on the Missouri River. About 30 miles of road is still to be graded between Faulkton and Pierre, 70 miles apart, but most of the right of way has been already granted.

Grand River & Mahoning.—This company, whose principal office is in Cleveland, has just been organized, with a capital stock of $1,000,000, to construct a road from the south shore of Lake Erie at Grand River to Steubenville. The incorporators are James Ritchie, Thomas Deering, E. J. Blendin, E. Tupper and William L. Rice.

Great Northern.—A contract has been let to Foley Brothers and Guthrie, of St. Paul, for the construction of a 20-mile extension of the Park Rapids branch. This line will extend northeast toward Leech Lake, Minn., and is to be completed by Aug. 1.

Over 2,000 men are still employed on the ballasting and other finishing work on the Pacific extension between Granite Point and the switchback over the Cascade Mountains. If the work is not delayed by unfavorable weather the entire extension will be ready for through traffic to the Pacific Coast by April 15. The officers have not yet decided upon the date for opening the extension for through passenger traffic.

Gulf, Beaumont & Texas.—This company has been organized at Beaumont, Tex., lately, and has just filed its charter at Austin. The route is given in the charter as to extend through the counties of Jefferson, Hardin, Orange and Jasper. The Directors are H. J. Pratt and N. D. Silsbee, of Boston; John H. Kirby, of Houston; W. Weiss, W. A. Fletcher and W. C. Averill, of Beaumont, Tex. The officers are: H. G. Pratt, President; John H. Kirby, Vice-President; N. D. Silsbee, Treasurer; W. C. Averill, Secretary.

Kanawha & Michigan.—The grading on the Gauley River extension which is to connect this road with the Chesapeake & Ohio, in the Kanawha Valley, has been nearly completed as far as Kanawha Falls, W. Va., and the new line is expected to be ready for the tracklayers within two months. Work on the bridges at Narrow Falls, and at the mouth of Gauley River, is being pushed rapidly. The Keystone Bridge Co. has the contract for the Gauley bridge, and the Phœnix Bridge Co. the one at Narrow Falls. The new road is 32 miles long from Malden to Gauley River.

Lake Providence.—An election has been ordered at Lake Providence, La., to vote on a proposition for a township tax in aid of a proposed narrow gauge railroad from Providence west through Carroll County, to Bayou Macon, about 10 miles.

Lancaster, Oxford & Southern.—An inspection was made last week of the line in Cecil Council, Md., recently completed from Childs, on the Philadelphia division of the Baltimore & Ohio Railroad, to Providence, Md., a distance of five miles. The party comprised President W. J. Franklin and Chief Engineer A. M. Nevin, of the road; W. Van Smith, Superintendent Baltimore & Ohio; County Commissioners and others. The line will be opened shortly. At present it will be operated only for freight traffic. Along the line several paper mills are located. It is proposed to extend the road to Oxford, Pa., 8½ miles distant from Providence, where it will connect with the Lancashire, Oxford & Southern.

Llano Improvement Co.—The stockholders had a meeting at Llano, Tex., last week, and authorized a contract with a Mr. Dyer who has offered to build a terminal railroad from Llano to the Iron Mauntain, for hauling iron ore from the mines at that point.

Manitoba & Northwestern.—The Canadian government has refused the application of the company for a loan of $1,600,000, to enable it to complete its line to Prince Albert.

Mexican Eastern.—A bill has been introduced in the Connecticut Legislature incorporating the above railroad company. It is authorized to acquire property and operate a railroad in Mexican and adjacent states. The stock is $600,000.

Middle Georgia & Atlantic.—The rails are now being laid between Machen and Covington, Ga., a distance of 25 miles. The road between these two points was graded over a year ago, and the only work which remains to be done is to build trestles over four creeks and to lay the rails. It is expected to have the road completed to Covington within 90 days, the work being done by the company's forces. The line between Eatonton and Machen, 18 miles, has been in operation since Dec. 31, 1891, and with the extension northwest to Covington the line will be 45 miles long, including a branch of 13 miles to Social Circle.

Monterey & Mexican Gulf.—Press dispatches state that construction has been begun on the extension of the road from Trevino, Mex., west toward Sierra Mojada, the great silver-ore producing region of the state of Coahuila. Several thousand tons of rails for the new line are reported to have arrived at Tampico, Mex.

Montreal & Western.—Lieut.-Gov. J. A. Chapleau has resigned as President of this road, and is succeeded by J. D. Rolland. The rails have been laid up to Devil's River, three miles beyond St. Jovits, P.Q. The work will be prosecuted vigorously this summer, and they expect to complete the road north to Chute aux Iroquois by the autumn.

Myrtle Springs.—E. A. Shaves, President of a proposed railroad from Wills Point to Myrtle Springs, Tex., explained the plans of his company at a meeting at Wills Point, Tex., last week, and the citizens of that town agreed to secure free right of way for four miles of the line and $1,000 as a subsidy in cash. The line proposed will extend from Wills Point on the Texas & Pacific, southeast through Myrtle Springs, a distance of about ten miles.

Nevada Southern.—The route of this road now under construction is from Blake Station, Cal. (formerly Goffs), on the Atlantic & Pacific Railroad, 30 miles west of Needles, through Vontrigger, New York, Vanderbilt, Dry Lake, Ivanpah and State Line to Good Springs, in Lincoln County, Nev., a total distance of 100 miles. The construction of the first 30 miles will be completed and the road will be in operation to a point between Manvel and Vanderbilt by April 1, and a portion of the road has been surveyed beyond that point. Bright & Crandall, of Los Angeles, Cal., are the contractors. The maximum grade, so far as constructed, is two and one-quarter per cent., and on the extension will probably be as high as three per cent. Only the passenger equipment will be purchased until the whole road is completed and experience has demonstrated the kind of equipment best suited to the grades, curves and the traffic of the road. The road will be bonded to the extent of $15,000 per mile of road. The Metropolitan Trust Company, of the city of New York, is the Trustee, and the bonds are 30 year five per cent. first mortgage gold bonds.

New Roads.—L. C. Martin, a resident of Hidalgo County, Tex., who is interested in the project for a road along the Rio Grande River from Laredo to Brownsville, a distance of 200 miles, says that $60,000 of the stock of the company has been subscribed by citizens.

Norwalk, Fairfield & Southern.—This company has been organized to build a line to be operated by steam or electricity between Norwalk and North Fairfield, in Hudson County, O. The capital stock is $50,000 and the incorporators are Charles P. Wickham, T. F. Hildreth, Jay F. Laning, Harry H. Hoyt, S. E. Crawford, Frank H. Evans and John A. Williams.

Ohio River, Smithfield & Lake Erie.—The charter of this company was filed in Ohio this week, with principal office at Steubenville. The projected line extends from Steubenville to Cleveland. Hugh Hammond, Evan H. Purvance, William Hammond, George W. Doty and Lewis McLeaver are the incorporators.

Philadelphia, Honesdale & Albany.—The charter of this company has been filed in Pennsylvania, the names of the directors being reported in another column. The route of the road, as given in the charter, is from White Haven, Luzerne County, northeast by the most practical route to the New York state line at a point on the Delaware River opposite Hancock, Delaware County, N. Y. The length of road here outlined is about 90 miles. The preliminary surveys for this line were begun early in February and are still in progress under the direction of F. F. Whittlekin, of Tionesta, Pa., the Chief Engineer. Four parties of engineers are engaged in the surveying.

Pine Bluff & Sulphur Springs.—Two surveys have already been made for this short road in Arkansas, which was incorporated late in January, but the route is not yet fully decided upon. The surveys were made between Pine Bluff and Sulphur Springs, Ark., seven miles, by John J. Martin, Chief Engineer. The officers expect to begin the construction in a few weeks. R. D. Davidson is President and W. A. Leach Manager, both of Pine Bluff, Ark.

Pittsburgh, Cincinnati, Chicago & St. Louis.—The force on the extension of the New Cumberland, W. Va., branch of this road is to be doubled April 1, and the work completed as soon as possible. Nearly all the grading has been completed as far as a point opposite Welisville, O., where the space between the hill and the Ohio River is very narrow. At this point the county road interferes, and a new road will have to be built. About 150 men have been at work at this point all winter. The contractors have promised to have the road completed as far as Hamilton, half way, by May 1. The roadbed is ready for the rails as far as Mahan's, with the exception of an iron bridge at the mouth of Tomlinson's Run, and this bridge is ready to be erected as soon as the foundations are completed. Two pile drivers are at work on the trestle at Mahan's, and will soon have it completed. The extension will be of the most substantial character, and some further improvements will be made in the old part of the New Cumberland branch.

Quaker City Elevated.—President Charles W. Bucholtz, of the Quaker City and Northeastern Elevated railroad companies, is pushing the work on the above named lines in Philadelphia, and wherever the company is not enjoined it will proceed vigorously with the work of construction. Work on the Northeastern line is progressing at two points on the route above Market street. One of the sections is the three blocks between Market to Vine on Front street, and the other the three squares between Berks and Harrison streets. Upon the lower section the work has progressed favorably and many of the foundations are ready for the iron structure.

Santa Fe, Prescott & Phœnix.—The construction work on this road to Prescott, Ariz., has been pushed vigorously during the winter under the direction of G. W. Vaughn, Vice-President and Chief Engineer, and the grading is nearly completed on the 60 miles from Ash Fork south to Prescott. Over 35 miles of the track has also been laid between these points, about 20 miles having been built since Jan. 1, and it is expected to have the rails laid as far as Prescott about April 1. The locating survey is now being completed to Phœnix, and the officers expect to complete most of the grading to that point during the present year. The road will be nearly 200 miles long, its most important railroad connection being with the Atlantic & Pacific at Ash Fork, Ariz., the northern terminus.

Sioux Falls, Yankton & Southwestern.—The grading has been resumed on this road near Yankton, S. D., and the sub-contractors are organizing their forces, and the construction work will be in progress on the entire road between Sioux Falls and Yankton as soon as the ground is in fit condition. Some work has been going on most of the winter and the bridges over the Big Sioux River at South Sioux Falls and over the Jim River are now well along. The road is being built between Sioux Falls and Yankton, 63 miles, and it is expected to finish the tracklaying by July 1. W. H. Knowlton is Chief Engineer.

South Bound.—The Southern Supply Company which has the contract for the Jacksonville extension of this road has had a force of 1,000 men at work on the grading through most of the winter, the number of men now engaged on the work being about 1,500. Mr. I. Y. Sage, of Atlanta, President of the construction company, says there is no doubt that the extension will be completed in October next, which was the time announced for the completion of the work when the contract was awarded. The extension is 114 miles long from Savannah south in a nearly direct line to a point called Hart's Roads, Fla., on the Florida Central & Peninsular road, which will operate the line when completed.

Spokane Falls & Northern.—President D. C. Corbin has recently returned to Spokane, Wash., from Victoria, B. C., where he succeeded in securing a charter from the Provincial Government for the construction of a railroad from Northport, northwest through the Sheep Creek District in British Columbia. The new line will be about 15 miles long. No surveys have yet been made, but Mr. Corbin and the Chief Engineer, E. J. Roberts, have both been over the proposed line. The work on this road will not be commenced until the extension to Nelson, B. C., is completed, and this may delay it until next year. The work on the Nelson & Fort Shepherd road has been delayed by the severe winter, but the contractors have finished most of the rock work on the Columbia River and the grading will probably be finished from Northport to the International Boundary Line soon after April 1. The officers expect to be delayed by the bridge work at the Pend d'Oreille River, which, although under contract to be finished by June 1, can hardly be completed by that time.

Toledo & Ohio Central.—The contractors will probably commence work before April 1 on the extension from near Ridgeway south toward Columbus, O., 60 miles. Gen. J. S. Casement, the contractor, is arranging to begin work north and south of Marysville. The intention is to have trains running by Aug. 1.

Toledo, Walhonding Valley & Ohio.—General Manager Wood, of the Pennsylvania Company, announced the formal opening of this road for regular traffic to Coshocton, O., on March 20. The new line extends from a junction with the Fort Wayne road at West Loudonville southeast to Coshocton, connecting there with the Panhandle route. There are 15 stations on the new road, eight of them having agents, the principal towns being Loudonville, Walhonding, Mohawk and Coshocton. The line will be operated as part of the Toledo Division of the Pennsylvania Co.

Union Exchange & Transfer.—This is the name of a new road, whose proposed route has just been given in some detail. Briefly, the projected line is to be built from Library, 12 miles from Pittsburgh, on the Wheeling Division of the Baltimore & Ohio to the Monongahela River, where it will parallel the Pittsburgh & Lake Erie to Monongahela City, thence to Charleroi and to Layton station on the Baltimore & Ohio main line, about 40 miles in all.

Waco & Trinity.—The people at Waco, Tex., believe that the growth of that town requires the construction of a railroad to the pine lands in eastern Texas, and they have made various offers to railroad builders. They have now decided to organize a local company, and at a meeting last week R. B. Parrott, E. A. Rotan, J. W. Mann and others were appointed a committee to secure the charter, right of way, and stock subscriptions for a line from Waco east to Trinity, about 100 miles.

West Virginia & Pennsylvania.—The latest and in fact the only authoritative information that has been given out concerning the reported deal between this company and the Pennsylvania, whereby the Pennsylvania was to secure a right of way, surveys and other preliminary work for a line from its main line, in Pennsylvania, to the coal fields in Marion County, West Vir-

ginia, was given by a member of the old board of directors last week, at Morgantown, W. Va. President Lowndes called a meeting of the stockholders, mention of which was made last week, and asked the old board of directors to resign. He stated that he had secured the aid of people who would build the road, and that they wanted representation on the board of directors.

GENERAL RAILROAD NEWS.

Canadian Pacific.—The Railway Committee of the Canadian Parliament has passed a bill enabling this company to issue preferred stock upon the consent of at least two-thirds of the stockholders. It is also provided that the aggregate amount of such stock shall not at any time exceed one-half the aggregate amount of the ordinary stock then outstanding.

Choctaw Coal & Railway Co.—The proposed plan for the reorganization of the company has been abandoned owing to failure to secure the assent of some of the creditors. The plan was formulated by a committee consisting of E. P. Wilbur, Effingham B. Morris and Sidney F. Tyler.

Cincinnati, New Orleans & Texas Pacific.—Upon petition of Samuel Thomas, of New York, the appointment of a receiver was made March 17, by Judge William H. Taft, of the United States Circuit Court. S. F. Felton, President of the company, was appointed Receiver. It is said that the petition alleges the insolvency of the company and its inability to give bonds for defending itself against claims which amount to nearly $500,000, on account of the defalcation of Secretary and Treasurer Doughty several years ago, this suit having recently been decided against the company, and that it is unable to avoid attachments of its property in cases of judgments against it.

Cleveland, Lorain & Wheeling.—General Manager W. R. Woodford tells the newspapers that the statements that this road has been purchased by the Cincinnati, Hamilton & Dayton or in its interest are without the least foundation. Mr. Woodford states that only one or two of the New York syndicate which purchased the controlling interest in the above road from the Chamberlain estate, at Cleveland, were interested in the Cincinnati, Hamilton & Dayton, and the road will continue to be operated as an independent line.

Illinois Central.—The income from traffic for the seven months ended Jan. 31, 1893, and 1892, is shown in the following table:

	1893.	1892.	Inc. or dec.
Miles operated	2,888	2,884	I. 4
Gross receipts	$11,740,955	$11,680,445	I. $60,510
Oper. expen. and taxes	8,468,016	8,227,520	I. 240,496
Net earnings	$3,272 939	$3,452,025	D. $179,986

The gross receipts from traffic for the month of February, 1893, are estimated at $1,472,118. The receipts for February, 1892, were $1,570,163, the estimated decrease being $98,045.

New York Central & Hudson River.—A special meeting of the stockholders will be held at Albany, N. Y., April 19. The meeting is called for the purpose of voting upon the purchase of control of the New York & Northern, and to approve the leasing of the Mohawk & Malone (the Adirondack & St. Lawrence Line), the Gouverneur & Oswegatchie, and the Carthage & Adirondack roads. The control of the New York & Northern was obtained by the purchase of the controlling interest in the stock and bonds for about $4,000,000. In a circular to the stockholders explaining the purchase of the road it is said that the company has a fine bridge across the Harlem River, and has, within the limits of the city of New York, eight miles of a 100-ft. roadway, and it owns 32 acres of terminal property, also within the limits of the city. "It is proposed, after the control is acquired, to enter into a lease with the present company, or perhaps with a company to be organized in its stead, under which this company will guarantee the principal and interest of $5,000,000 in 4 per cent. 100-year gold bonds. Of this amount $4,000,000 will represent the cost of control, and $1,000,000 will be reserved for developing, improving and bettering the line." The leases to be voted on are practically perpetual. The Mohawk & Malone extends from Herkimer northerly to Malone, with branches to Saranac Village, to Cranberry Lake, etc., the whole being about 177 miles. It traverses centrally the Adirondack region. From Malone a northerly connection is made crossing the St. Lawrence River at Coteau, and going into Montreal over the Grand Trunk. The terms of the lease are: That all the capital stock shall be given to the Central; that it shall guarantee $2,500,000 in four per cent. 100-year gold bonds, and the present owners of the property shall be permitted to issue and retain $3,900,000 in non-cumulative five per cent. 100-year income bonds. The Gouverneur & Oswegatchie is a branch line from Gouverneur, on the Rome, Watertown & Ogdensburg, to the village of Edwards, the length being about 15 miles. For this line the New York Central is to guarantee $300,000 in five per cent. 100-year bonds, and all the stock is to be given to it. The Carthage & Adirondack extends from Carthage, on the Rome, Watertown & Ogdensburg, eastwardly to near Tupper Lake in St. Lawrence County, with short branches, the whole length being about 43 miles. For this line the Central is to guarantee four per cent. gold bonds, maturing in 1981, to an amount not exceeding $1,600,000. Of these bonds $1,100,000 only are to be presently issued, and the remaining $500,000 will be retained for improvements or extensions. A branch of the line eastwardly for some five miles will connect the railroad with the Mohawk & Malone.

Following are the figures of the company's earnings for the quarter ended March 31:

	1893.	1892.	Inc. or dec.
Gross earnings	$10,341,395	$10,404,559	D. $63,164
Oper. expenses	6,975,354	7,543,854	D. 568,500
Net earnings	$3,366,041	$2,860,705	I. $505,336
Fixed charges	2,552,028	2,479,120	I. 72,908
Balance	$814,013	$381,585	I. $432,428
Dividend	1,117,853	1,117,853	
Deficit	$303,841	$736,269	D. $432,428
Nine months ending March 31:			
Gross earnings	$34,607,275	$34,558,177	I. $49,098
Oper. expenses	23,691,423	23,548,802	I. 142,426
Net earnings	$10,915,847	$11,009,375	D. $93,528
Fixed charges	7,516,155	7,411,496	I. 104,659
Balance	$3,399,691	$3,597,878	D. $198,187
Dividend	3,353,561	3,353,561	
Surplus	$46,130	$244,317	D. $198,187

New York, New Haven & Hartford.—It is announced that the shortening of time of the fast passenger trains between New York and Boston to five hours will be made in May.

The Massachusetts Legislature has adopted an order to inquire into alleged discrimination by this road against its competitors in traffic to and from Boston. The preamble to the order states that "the interests of Boston require that traffic between that city and New York should not be under the control of any one road." The movement seems to be aimed at the alleged diversion of freight from Western points which, it has been reported, was ordered by the shippers to go over the New York & New England, but was sent by the New Haven road to Boston over the Old Colony.

Philadelphia & Reading.—Application was made to the United States Circuit Court at Philadelphia on March 20 by the receivers of the Company for permission to issue $5,500,000 worth of Receivers' certificates with which to meet pressing liabilities. Judge Dallas referred the application to George L. Crawford, as Master, to report to the Court on the advisability of authorizing the issue. In their petition the receivers say they have been unable to make substantial reduction in the indebtedness that was due for materials and supplies on Feb. 20, when the Company passed into their hands, and that the indebtedness at the present time is as follows: Railroad Company—Materials and supplies, $1,430,000; balance due other railroad companies, $1,110,000. Coal & Iron Company.—Materials and supplies, $377,000; coal purchases, about $1,736,000. That, in addition to the above amount, wages have accrued since Feb. 20, 1893, to the following amounts: Railroad Company, $1,400,000; Coal & Iron Company, $700,000. These sums altogether amounted to $7,053,000. The receivers believe that with $5,500,000 new money they will be able, with current receipts, to meet the current liabilities during the year ending in March, 1894, such liabilities to include interest, rentals, guarantees and outlays for equipment, notes and car trusts maturing on contracts made prior to Jan. 1, 1893.

Union Pacific.—The earnings for January for the entire system and several of the subsidiary companies, are given in the following statement:

OREGON SHORT LINE & UTAH NORTHERN.

January:	1893.	1892.	Inc. or dec.
Gross earnings	$133,151	$183,747	D. $50,596
Oper. expenses	315,906	331,605	D. 15,699
Net earnings	$117,245	$152,142	D. $34,897

UNION PACIFIC, DENVER & GULF.

January:			
Gross earnings	$485,143	$443,043	I. $42,100
Oper. expenses	345,931	359,672	D. 13,741
Net earnings	$139,212	$83,371	I. $55,841

UNION PACIFIC SYSTEM PROPER.

January:			
Gross earnings	$3,037,693	$3,050,468	D. $12,775
Oper. expenses	2,122,361	2,113,419	I. 8,942
Net earnings	$915,332	$937,049	D. $21,717

GRAND TOTAL OF UNION PACIFIC SYSTEM.

January.			
Gross earnings	$3,163,222	$3,214,128	D. $50,906
Oper. expenses	2,207,099	2,214 799	D. 7,700
Net earnings	$956,123	$999,329	D. $43,206

West Virginia Central & Pittsburgh.—The long contest between Alexander Shaw, a large minority stockholder in the railroad, and the directors, was ended this week by Judge Dennis, of Baltimore, refusing to grant Shaw's application for an injunction to restrain the company from buying or leasing the Piedmont & Cumberland road.

TRAFFIC.

Traffic Notes.

The New Jersey Legislature has passed a law regulating the rates of transportation for peaches and small fruits.

About 250,000 cars passed through the St. Clair tunnel in the calendar year 1892. The number of cars taken through was 111,193 freight cars east and 110,004 west; passenger cars 10,768 east and 10,891 west.

The American Express Company has secured exclusive rights over the Illinois Central from Chicago to New Orleans, replacing the Southern Express Company from Cairo southward, and will begin business on the road April 1.

The Trunk lines carrying grain from Lake Erie ports to New York have established a joint freight agency at the New York Produce Exchange. It is said that three-fourths of this grain is carried on contracts made at the Produce Exchange.

The anthracite coal-carrying roads have decided to reduce the freight rates on coal from the mines to tide-water (New York Harbor) 15 cents a ton. The reduction is to take effect on April 1. It is the result of the lowering of prices of coal for April about 50 cents.

It is reported at Memphis that the St. Louis, Iron Mountain & Southern will establish a freight transfer boat across the Mississippi, the rate for hauling cars over the bridge, $4, being regarded as too high. It appears that the Little Rock & Memphis continues to transfer its freight by boat, the same as before the bridge was built.

The St. Louis & San Francisco and the Atchison have issued the announcement of their new fast train which is to run between St. Louis and Galveston, beginning April 2. The trains will be composed of new cars, vestibuled, and the time through will be 37 hours, which is five hours less than the best time now made. Meals will be served on dining cars south of Monett, Mo.

The lines competitors for passenger business between St. Louis and Cincinnati have agreed to appoint a member from each of their several boards of directors who shall have charge of this business and who shall appoint a commissioner or agent to adopt and enforce rules and regulations to govern the business. This action is made effective May 1, and to continue for one year, and afterward subject to 30 days' notice. Pending the inauguration of this action rates are to be (on April 1) advanced to $9 in either direction between St. Louis and Cincinnati, three-trip tickets of every kind are abolished, and the parties pledge themselves not to pay commissions nor to reduce the $9 rate.

The representatives of eastbound lines from St. Louis, Louisville and Cincinnati held a meeting at Cincinnati, March 17 and 18, and all agreed to the carrying into effect of the agreement adopted by the presidents at New York, Feb. 24, in regard to the discontinuance of passenger commissions on all eastbound traffic, the action to take effect April 1. The resolutions had already been put in effect as to Chicago, but the assent of the Chesapeake & Ohio and the Ohio & Mississippi was necessary to the St. Louis and Cincinnati agreement. Some further local questions yet remain to be adjusted before it is certain that the agreement will be carried into effect, but the reports of the Cincinnati meeting indicate a strong probability that nothing further will prevent the final acceptance of the agreement by all parties.

The commerce of Galveston, especially the export grain trade, is the subject of a long article in a recent number of the Galveston *News*. Galveston is the second cotton exporting port in the United States, exporting over a million bales a year, so that the wharfage and other facilities are in many respects already well adapted to facilitate a large increase in the grain trade. The long jetty, which has been for months in course of construction by the Government, is nearly finished, and the harbor will thereby be greatly improved. The Galveston Wharf Company is expending $1,500,000 in improving wharves and docks, masonry having been built in the place of many wooden wharfs, and railroad tracks having been laid to run cars directly to ships. This company has built an elevator of one million bushels capacity, and there was already one holding 400,000 bushels. In order to induce the railroads to make lower rates on grain from Kansas, Galveston parties went up there, and bought large quantities and since this was done in November last, 3,867 cars of wheat and corn have been received at Galveston. The freight bills on this were $330,000. The rate is now 32 cents per 100 lbs. on wheat, 30 cents, on oats and 27 cents on corn and hay from all points in Kansas. It is said that the harbor dues at Galveston are cheaper than at any other point which competes with it.

Chicago Traffic Matters.

CHICAGO, March 22, 1893.

Western Freight Association lines at their meeting last week made a number of reductions in rates, among them a reduction in the rate on lumber from Duluth to Chicago from 20 to 16 cents per 100 lbs., and a reduction on iron and iron pipe rom the same point from 22 to 16 cents.

The postponed meeting of the Western Passenger Association for the consideration of World's Fair rates is called for March 27. No call has yet been issued for the special meeting to consider the new agreement, owing to the absence from the city of representatives of some of the lines.

Central Traffic Association compilers and rate clerks are to meet April 4 to make changes in the quarterly rate sheets for the May issue.

The Freight Committee of the Central Traffic Association has reaffirmed for the current year the uniform charge of $2.50 per ton for ice (including cost of salt and labor) for icing dressed beef shipments; this charge also to apply on all shipments which shippers desire iced in transit at their expense, otherwise than provided for in the official classification.

The Central Traffic Association has withdrawn from through eastbound rates on leather from Pacific Coast points and has decided to require full established locals east of junction points after April 1. The Association has also reaffirmed its non-participation in the new rates established by the Northern Pacific, Union Pacific and Great Northern to North Pacific Coast points, and will require full local rates as its proportion of the through rates east of Mississippi River junction points.

The partial blockade on the railroads running east from Chicago, which began during the severe winter weather six or eight weeks ago, and which it has been hard to raise on account of the continued heavy movement of freight, has finally disappeared, or nearly so. The Chicago & Erie has notified its connections to this effect and the Chicago & Grand Trunk did the same last week. The freight movement, both eastbound and westbound, is still heavy, and Chicago yards are worked under considerable difficulties.

The shipments of eastbound freight, not including live stock, from Chicago, by all the lines for the week ending March 18, amounted to 88,615 tons, against 83,758 tons during the preceding week, an increase of 4,857 tons, and against 80,640 tons during the corresponding week of 1892. The proportions carried by each road were:

Roads.	W'k to Mar. 18.		W'k to Mar. 11.	
	Tons.	P. c	Tons.	P. c.
Michigan Central	5,894	6.6	7,460	8.9
Wabash	6,788	7.7	7,464	8.9
Lake Shore & Michigan South.	18,201	20.6	16,597	19.8
Pitts., Ft. Wayne & Chicago	12,590	14.2	10,364	12.4
Pitts., Cin., Chicago & St. Louis	8,228	9.3	9,638	11.5
Baltimore & Ohio	6,622	6.8	3,966	4.7
Chicago & Grand Trunk	9,435	10.6	8,115	9.7
New York, Chic. & St. Louis	7,503	8.5	5,570	6.6
Chicago & Erie	11,000	12.4	11,696	14.0
C., C., C. & St. Louis	2,954	3.3	2,888	3.5
Totals	88,615	100.0	83,758	100.0

Of the above shipments 15,714 tons were flour, 45,073 tons grain and millstuff, 5,464 tons cured meats, 10,037 tons dressed beef, 1,080 tons butter, 1,502 tons hides, and 6,133 tons lumber. The three Vanderbilt lines carried 35.7 per cent., the two Pennsylvania lines 23.5 per cent.

The Interstate Commerce Commission.

The Commission has decided the case of James & Abbott against the Canadian Pacific, the Maine Central and the Boston & Maine in favor of the complainants.

Among other points it is held that the "drive" of shingle logs down rivers which flow past the place of cut in Maine to a seaport in Canada where shingle mills are located, and from which the product may go by sea to market ports, affects shingle traffic from competing mills located along these rivers at a place in Canada and a place in Maine, but operates with less force at the latter point. The rail rate from the Canadian mill to market being fixed with special reference to the effect of the log drive to and water competition for shingle traffic from the seaports, the rate from the Maine mill should be made upon the same basis. The defendants are therefore ordered to restore the relation of rates on shingles to Boston, which they established after the filing of complaint herein, but soon after discontinued, to wit, a rate from Fort Fairfield, in Maine, of not exceeding 6½ cents above the rate in force from Fredericton, in Canada. Complainant's claim for reparation is denied.